

# **Nirma University Institute of Technology**

## **B.Tech. in Civil Engineering**



### **CRITERIA 1.1.3**

**Courses having focus on employability/  
entrepreneurship/ skill development  
offered by the University**

**NIRMA UNIVERSITY**

**Institute of Technology**

**Bachelor of Technology – Civil Engineering**

**Semester – I/II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

<b>Course Code</b>	2CL201
<b>Course Title</b>	Introduction to Civil Engineering

**Course Learning Outcomes:**

At the end of the course, students will be able to –

1. explore the scope of various disciplines of Civil Engineering
2. perceive the Role of a Civil Engineer in the construction industry
3. appraise possible avenues of career and entrepreneurial opportunities in the Civil Engineering profession

**Syllabus:**

**Teaching Hours: 15**

**Unit 1: Overview of Civil Engineering Hours: 02**

Evolution and broad disciplines of Civil Engineering, works of eminent civil engineers, scopes for a career as a Civil Engineer, construction as an industry, building & town planning, development of smart cities.

**Unit 2: Construction Technology and Management**

**Hours: 03**

Construction materials, recycling of construction materials, traditional and modern surveying techniques, construction methods and equipments, management of construction project, sustainability in construction, facility management, quality & HSE systems in construction.

**Unit 3: Structural Engineering**

**Hours: 03**

Types of structures, analysis and design of structures, geotechnical investigation and design of foundation, repair and rehabilitation of structures.

**Unit 4: Transportation Engineering Hours: 02**

Modes of transportation, intelligent transportation systems, urban transportation planning.

**Unit 5: Water Resources and Environmental Engineering**

**Hours: 02**

Fundamentals of fluid flow, water supply systems, multi-purpose reservoir projects, water treatment

systems, effluent treatment systems, solid waste management.

**Unit 6: Computational Tools in Civil Engineering**

**Hours: 02**

Overview of computational tools, ICT applications in Civil engineering, IoT in Civil engineering, 3D printing.

**Unit 7: Virtues of the Civil Engineer**

**Hours: 01**

Ethics, entrepreneurship, creativity & innovation, soft skills.

**Self-Study:**

The self-study contents will be declared at the commencement of semester.

**Suggested Readings:**

1. Saikia M.D. Elements of Civil Engineering. PHI Learning Pvt. Ltd.
2. Raikar, R.V. Elements of Civil Engineering and Engineering Mechanics. Laxmi Publications.
3. Punmia, B.C. Building Construction. PHI Learning Pvt. Ltd.
4. Jha, Kumar Neeraj. Construction Project Management: Theory and Practices. Pearson Education India.
5. Shah, H.J. & Junnarkar, S.B. Mechanics of Structures, Vol- I & II. Charotar Publishing House Pvt. Ltd.
6. Khanna, S.K., Justo, C.E.G. Highway Engineering. Nem Chand & Bros.
7. Martin, M.W., Schinzinger, R. Ethics in Engineering. McGraw-Hill Publication.

L= Lecture, T= Tutorial, P= Practical, C= Credit

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w.e.f. academic year 2018-19 and onwards

**NIRMA UNIVERSITY**

**Institute of Technology**

**B Tech, All Branches**

**Semester-I/II**

L	T	P	C
3	1	2	5

<b>Course Code</b>	<b>2CE101/2CS101</b>
<b>Course Title</b>	<b>Computer Programming</b>

**Course Learning Outcomes (CLOs):**

At the end of the course, students will be able to –

1. recognize the importance and apply C language constructs in program development,
2. analyse the problem and select the most appropriate method to solve it,
3. evaluate the correctness of the developed solution.

**Syllabus:**

**Teaching hours:**

**Unit I**

Introduction to Computers: Introduction to Computers and the Internet in Industry and Research, The Internet and World Wide Web, web Resources, Hardware and Software, Computer Organization, Programming Languages, Introduction to the C Programming Language, Typical C Program Development Environment and steps. Test-Driving a C Application in Linux, Running a C program Using GNU for debugging.

5

**Unit II**

Introduction to Programming: Memory Concepts, datatypes, operators and expressions, Decision Making, Bitwise Operators, Flowchart, Algorithms, Pseudocode, Test-cases, Repetition Statement, Counter-Controlled Repetition, Sentinel-Controlled Repetition, Nested Control Statements. Introduction some Simple C Program, I/O handling.

9

Programming with C: keywords, syntax and library functions, datatypes, declarative, imperative and decision statements. Control structures.

**Unit III**

Functions: Math Library Functions, User defined functions, Function Call Stack and Stack frames, Passing Arguments by Value and By Reference, Scope Rules, Recursion, Recursion vs. Iteration.

10

Arrays: Defining Arrays, Sorting Arrays, Searching Arrays, Multidimensional Arrays, Variable-Length Arrays, Passing Arrays to Functions.

**Unit IV**

Pointers: Pointer Variable Definitions and Initialization, Pointer Operators, Passing Arguments to Functions by Reference, Pointer Expressions and Pointer Arithmetic, Relationship between Pointers and Arrays, Arrays of Pointers, Pointers to Functions. Introduction to dynamic memory allocation.

11

Characters and Strings: Fundamentals of Strings and Characters,

Character-Handling Library Functions, String-Conversion Functions, Standard Input/Output Library Functions for string, String-Manipulation Functions of the String-Handling Library, Comparison Functions of the String-Handling Library.

#### **Unit V**

10

Structures: Structure Definitions, Defining Variables of Structure Types, Operations That Can Be Performed on Structures, Initializing Structures, Accessing Structure Members, Using Structures with Functions

File Processing: Files and Streams, Creating a File, Reading and writing Data from a File.

#### **Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

#### **Laboratory Work:**

Above concepts are to be implemented in C-language atleast with emphases on logic development and debugging, 10 experiments are to be carried out.

#### **Tutorial Work:**

The tutorial work will be based on the topics covered in the syllabus. Minimum 10 tutorials should be carried out.

#### **Suggested Readings<sup>^</sup>:**

1. Deitel and Deitel , C How to Program, Pearson
2. E. Balagurusamy, 'Programming in ANSI C", McGraw Hill
3. Yashwant Kanitker, Let Us C, BPB Publications
4. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India
5. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
6. David Gries, The Science of Programming, Springer
7. Dromey R.G., How to solve it by computers, Prentice Hall of India
8. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
9. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India
10. Sedgewick R., Algorithms in C, Addison Wesley
11. Schaum Ourline Series, Programming in C, , McGraw-Hill
12. E. Balagurusamy, Pointer in C, McGraw Hill

<sup>^</sup>This is not an exhaustive list

L= Lecture, T= Tutorial, P= Practical, C= Credit

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w.e.f. academic year 2018-19 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology – Civil Engineering**  
**Semester- I/II**

L	T	P	C
2	1	2	4

<b>Course Code</b>	2CL101
<b>Course Name</b>	Physics (Mechanics of Solids)

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

1. analyse structural systems under the effect of forces
2. determine various types of stresses developed in structural elements
3. evaluate properties of materials through experimentation

**Syllabus:**

**Teaching hours: 30**

**Unit-1: Mechanics of Rigid body**

**Hours: 10**

Review of Laws of motion, Motion of systems of particles and rigid body, Kinematics

System of forces: Free body diagrams, resolution of forces and equilibrium, analysis of truss

Friction: Cases of limiting and non-limiting friction

Distributed forces: Centroid, Centre of gravity and Moment of Inertia

Harmonic Oscillator

**Unit-2: Mechanics of Deformable body**

**Hours: 20**

Simple Stress and Strain: Concept of stress and strain, Stress-strain relationship, elastic constants, Compound stresses, Principal planes and Principal stresses, stresses in thin cylinder and spherical vessels

**Stresses in Beam:** Computation of Shear force and Bending moment, theory of simple bending, evaluation of Bending stresses and Shear stress

Torsion: Stresses and Strain in circular shaft

**Evaluation of Mechanical properties of materials**

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 08 experiments to be incorporated.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 08 tutorials to be incorporated.

**Suggested Readings:**

1. Meriam, J.L., & Kraige, L. G.. Engineering Mechanics. Wiley-India.
2. Hibbeler, R. C.. Mechanics of Materials. Pearson Publication.
3. Beer, F. P., Johnston, E. R., & Dewolf, J.T. Mechanics of Materials. Tata McGraw-Hill Education.
4. Shah, H.J., & Junnarkar, S. B.. Mechanics of Structures, Vol-1. Charotar Publishing House Pvt Limited.
5. Popov, E. P. Mechanics of Materials. Pearson Publication.

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w.e.f. academic year 2018-19 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology – All Programmes**  
**Semester – I/II**

L	T	P	C
1	1	-	2

<b>Course Code</b>	2CL102
<b>Course Title</b>	Environmental Studies

**Course Learning Outcomes:**

At the end of the course, students will be able to –

1. appraise the multidisciplinary nature of environment and sustainability
2. explain types of environmental pollution and its control measures
3. outline social issues related to environment

**Syllabus:**

**Teaching Hours: 15**

**Unit 1: Multidisciplinary Nature of Environment**

**Hours: 04**

Environment and its multidisciplinary nature, Ecosystems, biodiversity and its conservation, concept of sustainability, Environmental Impact Assessment, public awareness towards environmental conservation, Environmental legislation, carbon credit and carbon trading

**Unit 2: Environmental Pollution, Global Warming and Climate Change Hours: 07**

Types of environmental pollution and pollutants, causes, effects and control measures of – air pollution, water pollution, soil/land pollution, noise pollution, radioactive pollution. Role of an individual in prevention of pollution. Case studies on pollution, Effects – acid rain, ozone layer depletion and greenhouse effect. Sources, types and effects of waste, waste disposal and management, e-waste management

**Unit 3: Social Issues related to Environment**

**Hours: 04**

Environment ethics- issues and solutions. Energy and water conservation, rain water harvesting, water shed management, rehabilitation problems and concerns, environmental protection acts.

**Self-Study:**

The self-study contents will be declared at the commencement of semester.



**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 05 Assignments to be incorporated.

**Suggested Readings:**

1. Dara, S. S., & Mishra, D. D. A textbook of Environmental Chemistry and Pollution Control. S. Chand & Company Ltd.
2. Bharucha, E., Textbook of Environmental Studies, Universities Press.
3. Dhameja, S. Environmental Studies. S. Kataria and Sons.
4. Ristinen, R., & Kraushaar, J. Energy and the Environment, Wiley Publications.
5. Masters, G. Introduction to Environmental Engineering and Science. Prentice-Hall Publications.
6. Basak, A. Environmental Studies. Pearson Publications.

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w.e.f. academic year 2018-19 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**(B. Tech. All Programmes)**  
**(Semester I/II)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>2</b>	<b>3</b>

<b>Course Code</b>	<b>2CY101/CY101</b>
<b>Course Title</b>	<b>Chemistry</b>

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to –

1. relate the fundamentals and their application in various field of engineering,
2. identify and apply the principles of green chemistry in improving the existing technology,
3. categorize the materials on the basis of their properties,
4. select appropriate method of analysis and interpret its result.

**Syllabus**

**Teaching Hours**

<b>Unit 1 Water and its Treatment</b>	<b>08</b>
Introduction, Sources of water impurities, Hardness of water, Degree of hardness, Softening of water, Water treatment processes, Problems with boiler feed water and its treatments Specifications for drinking water (BIS standards)	
<b>Unit 2 Fuel</b>	<b>05</b>
Calorific Value, Types of fuel, Selection of fuels, Analysis of coal:- Proximate and ultimate analysis, Flue gases:- Orsat apparatus, Alternative fuels:- Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Ethanol, Bio-diesel	
<b>Unit 3 Lubricants</b>	<b>04</b>
Classification and functions of lubricants, Properties:- Lubricating oil and Greases, Selection of lubricants	
<b>Unit 4 Polymers and Composite materials</b>	<b>05</b>
Introduction to Polymers and Polymerization, Elastomers, Classification and uses, Biopolymers:-Cellulose and Starch, Advanced polymeric materials, Composites:- Introduction, Classification and Applications	
<b>Unit 5 Green Chemistry</b>	<b>03</b>
Overview, Set of Principles of Green Chemistry, Industrial applications	
<b>Unit 6 Engineering Materials</b>	<b>04</b>
Adhesives:- Characteristics, Classification, and Uses, Fullerenes:- Structure, Properties and Applications, Nanorods:- Brief Introduction, Organic Electronic Materials:- Introduction, Types and Applications, Liquid Crystals:- Introduction, Classification and Applications, Explosives:- Introduction, Classification, Characteristics, Disarmament, Weapons of Mass Destruction (WMD), Peaceful uses of explosives	
<b>Unit 7 Overview of electrochemical systems</b>	<b>01</b>

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### **Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

### **Suggested Readings**

1. P.C. Jain and Monika Jain, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
2. Shashi Chawla, Textbook of Engineering Chemistry, Dhanpat Rai Publishing Co.
3. S.S. Dara, Textbook of Engineering Chemistry, S. Chand and Company.
4. Mike Lancaster, Green Chemistry: An Introductory Text, Royal Society of Chemistry.
5. J.C. Kuriacose and J. Rajaram, Chemistry in Engineering and Technology, Tata Mc Graw Hill.
6. Prasanta Rath, Engineering Chemistry, Cengage Learning.
7. Sunita Rattan, A Textbook of Engineering Chemistry, S.K. Kataria & Sons.

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**w.e.f. academic year 2018 and onwards**

## 2EE101 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

### Course Outcomes (CO)

COs are clear statements of the expectations for student achievements in the course.

At the end of the course, a student will be able to –

1. interpret the importance of electrical energy and relate its usage in various applications,
2. illustrate the role of circuit elements in different system conditions,
3. distinguish the operational aspects of ac-dc systems and comprehend the principles of electromechanical energy conversion,
4. recognise the functions of electronic devices and basic circuits,
5. apply the concepts of number based conversion and Boolean algebra for digital logic design.

### Syllabus

Unit	Content	Teaching Hours
Unit - 1	<b>Review of dc Circuits</b> Kirchhoff's laws, solution of star-delta circuits, Joule's law of electric heating, relationship between various energy units, charging and discharging of capacitor, series-parallel magnetic circuits, fringing effect, comparison between electric and magnetic circuit, Concept of induced emfs, series-parallel connection of inductors, rise and decay of current in inductive circuit.	10 Skill Dev
Unit - 2	<b>Single-phase AC Circuits</b> Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits.	08 Skill Dev
Unit - 3	<b>Three-phase AC Circuits</b> Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, power measurement in three-phase circuit, variation in wattmeter reading with power factor.	07 Skill Dev
Unit - 4	<b>Electromechanical Energy Conversion</b> Concept of electro-mechanical conversion, energy balance, elementary concept of electrical machines, types of rotating electrical machines.	04 Skill Dev
Unit - 5	<b>Analog Electronics</b> Half and full wave rectifiers, special purpose diodes, regulator, BJT and its applications, amplifier, oscillator, overview of opto-electronics devices, opto-couplers, transducers, Operational amplifier, Comparator, Timer IC and multivibrators.	08 Skill Dev
Unit - 6	<b>Digital Electronics</b> Number systems and its arithmetic, binary codes, Boolean-algebra & simplification of Boolean expression; logic gates, concept of universal logic; implementation of Boolean expressions using logic gates, application of digital circuits (e.g. adder, subtractor, multiplexer, de-multiplexer, analog to digital converter, digital to analog converter)	08 Skill Dev

## **References**

1. B.L.Theraja, A.K. Theraja, Textbook of Electrical Technology Volume I –, S. Chand & Co.
2. A. E. Fitzgerald, Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical Engineering –TMH Publishing Co.
3. U. A. Patel, Textbook of Elements of Electrical Engineering, Mahajan Publishing House, Ahmedabad.
4. J. Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd.
5. Vincent Del Toro, Textbook of Principles of Electrical Engg., Prentice Hall of India Pvt. Ltd., New Delhi.
6. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta.
7. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons.
8. Robert Boylestad, Louis Mashlsky, Electronics Devices and Circuit theory, Peerson
9. M. Morris Mano, Digital logic and computer Design, PHI

## 2EE102 ELECTRICAL WORKSHOP [0 0 2 1]

### Course Outcomes (CO)

At the end of the, a student will be able to –

1. identify and propose appropriate electrical and electronic components for relevant applications,
2. select and make use of various laboratory equipment,
3. build simple domestic and industrial wiring systems,
4. apply basic maintenance and troubleshooting skills to house hold electrical appliances,
5. extend the awareness about safe practices in electrical systems.

### Syllabus

Unit	Content	Teaching Hours
1	<b>Wiring Techniques</b> Designing of domestic and industrial wiring, selection of wire, load calculations	2 Entre
2	<b>Introduction to Electronic Components</b> Study of various electronic components like, power and signal diodes, zener diodes, BJTs, FETs, LED, LDR, Photo diode, Photo transistor, SMD components, general purpose ICs, use of bread board	4 Skill dev
3	<b>Lab Equipment</b> CRO, DC regulated power supply, function generator, multimeter, single-phase and three-phase auto-transformer (variac)	4 Skill dev
4	<b>Introduction to Electrical Components</b> Study of different types of switches, solid state and electromagnetic relays, contactors, rheostats, different types of capacitors, resistors, variable inductor (choke) etc.	4 Skill dev
5	<b>Soldering Techniques</b> Basics of soldering techniques, effectiveness of soldering and problem associated with soldering, general purpose board soldering	2 Skill dev, Entre
6	<b>Basics of Household Electrical Equipment</b> Rewiring / replacement of fuse, switch board layout, functioning of switch, fan regulator, tube light, electric iron, electric heater	4 Skill dev
7	<b>Electrical Safety and Protection</b> Safety, electric shock, safety protections in electrical laboratory, methods of	4

	earthing, protective devices - fuses, MCB, ELCB and relays	Skill Dev, employ
8	<b>Designing of Electrical Panel</b> Basic design steps and criteria, selection of various components, layout of panel, ferruling, crimping, lugging, annunciation, display, mimic, meter mounting etc.	4 Entre
9	<b>Introduction to DC Machine</b> Study of various parts of DC machine. Operation of DC machine as DC motor	2 Skill Dev

## References

1. Mr. S. Samaddar, Textbook of Electric Wiring, New Central Book Agency (P) Ltd., Calcutta
2. Surjit Singh, Textbook of Electrical Design Estimating and Costing, Dhanpat Rai & Sons
3. Sengupta R., Textbook of Principles and Reliable Soldering Techniques, New Age International (P) Ltd
4. B. L. Theraja, A. K. Theraja, Textbook of Electrical Technology Vol – III, S. Chand Publishers., New Delhi
5. K. B. Bhatia, Textbook of Fundamentals of Maintenance of Electrical Equipment Khanna Publishers
6. Er. Mehta S. D., Textbook of Electronic Product Design Vol – I, S. Chand Publishers., New Delhi
7. Dr. S. K. Bhattacharya, Dr. S. Chatterji, Textbook of Projects in Electrical, Electronics, Instrumentation and Computer Engineering, S. Chand Publishers., New Delhi
8. National Electrical Code: Bureau of Indian Standards, Govt. Of India, 2011
9. Operating Manuals of Various Equipment

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**(B. Tech. All Programmes)**  
**(Semester I/II)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>1</b>	<b>1</b>	<b>2</b>	<b>3</b>

<b>Course Code</b>	<b>2HSI101/2HSB101</b>
<b>Course Title</b>	<b>English Communication</b>

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to -

- acquire adequate proficiency in English communication including reading and listening, comprehension, writing and speaking skills,
- apply the dynamics of communication skills.

**Syllabus:**

**Vocabulary Building**

**Teaching hours: 4 hrs**

**(L)**

Origin of English Language, Types of English, The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

**Basic Writing Skills**

**Tutorial hours: 3 hrs**

**(T)**

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely.

**Identifying Common Errors in Writing**

**Teaching hours: 2 hrs (L), Tutorial hours:**

**2hrs (T)**

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Cliches.

**Nature and Style of sensible Writing**

**Teaching hours: 3hrs**

**(L)**

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.

**Writing Practices**

**Tutorial hours: 4 hrs**

**(T)**

Comprehension, Precis Writing, Essay Writing, Idea Expansion.

**Oral Communication**

**Tutorial hours: 6 hrs**

**(T)**

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm.

**Persuasive Communication**

**Teaching hours: 6 hrs**

**(L)**

Communication at Workplace: Report, Application and email writing, Referencing, Interviews, Formal Presentations.

**Laboratory Work**



Practices related to tenses, prepositions, word formation/transformation concord, affixes, one-word substitutes, idioms etc. **Vocabulary building, Presentations and Group Discussions.**

## **Self-Study**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **suggested Readings:**

- (i) Selected Texts and excerpts.
- (ii) Selected movies and TED talks  
King's Speech  
Babel  
Episodes of Yes Prime minister  
Episode of Sherlock
- (iii) Practical English Usage, Michael Swan, OUP. 1995.
- (iv) Remedial English Grammar, F.T. Wood, Macmillan. 2007
- (v) On Writing Well, William Zinsser, Harper Resource Book. 2001.
- (vi) Study Writing, Liz Hamp-Lyons and Ben Heasley, Cambridge University Press. 2006.
- (vii) Communication Skills, Sanjay Kumar and PushpLata, Oxford University Press. 2011.
- (viii) Word Power Made Easy, Norman Lewis.
- (ix) Raymond Murphy, Essential English Grammar: A Self-Study Reference and Practice Book for Elementary Students of English with Answers, Cambridge University Press.
- (x) Collins Academic Skills Vocabulary Organizer.
- (xi) Collins Writing Skills B2+.
- (xii) Real Life Real Listening-Collins.

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology (All)**

**Semester I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

<b>Course Code</b>	<b>2MA101</b>
<b>Course Title</b>	<b>Linear Algebra</b>

### Course Learning Outcomes (CLO)

At the end of the course, students will able to-

1. acquire basic knowledge of matrix theory,
2. comprehend basic concept of vector space and linear transformation,
3. apply the knowledge of linear algebra in engineering problems.

### Syllabus:

#### Matrix Theory Teaching hours: 23

Review of algebra of matrices, Rank of matrix, Inverse of matrix by Gauss-Jordan method, Solution of system of algebraic simultaneous equations, Linearly dependent and Linearly independent functions, Caley-Hamilton Theorem (without proof), eigen values and eigen vectors, Eigen values and eigen vectors of orthogonal, symmetric, skew-symmetric matrices, Hermitian matrix, skew-Hermitian matrix, Unitary matrix, Normal matrix, Algebraic and geometric multiplicity, Diagonalization, Spectral theorem for Real symmetric matrices, Application of quadratic forms.

#### Vector Space and Linear Transformation Teaching hours: 22

Definition of vector space, subspaces, linear combination, Linearly dependent and linearly independent vectors, Basis of vector space, Dimension, Rank-Nullity theorem (statement and verification by examples), Definition of linear transformation, types of linear transformations (Rotation, Reflection, Expansion, Contraction, Projection), Matrix of Linear transformations, Change of basis and similarity.

### Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

### Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

### **Suggested Readings:**

1. D C Lay, Linear Algebra and its Application; Pearson Publication
2. E Kreyszig, Advanced Engineering Mathematics; John Wiley Publication
3. H Anton, Elementary linear algebra with applications; John Wiley Publication
4. K Hoffman and R Kunze, Linear Algebra; PHI Publication
5. S Kumaresan, Linear algebra - A Geometric approach; PHI Publication
6. J P Sharma and M Yeolekar, Engineering mathematics Vol-II; PHI Publication

L = Lecture, T = Tutorial, P = Practical, C = Credit

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology (All)**  
**Semester II**

L	T	P	C
3	1	0	4

<b>Course Code</b>	<b>2MA201/MA102</b>
<b>Course Title</b>	<b>Calculus and Differential Equations</b>

### Course Learning Outcomes (CLO)

At the end of the course, students will be able to-

1. apply differential and integral calculus to solve engineering problems,
2. use power series to solve differential equations appears in engineering field,
3. deal with functions of several variables that are essential in engineering.

### Syllabus:

#### Calculus Teaching hours: 7

Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions

#### Infinite Series Teaching hours: 7

Convergence of series, tests for convergence, power series, Taylor's and Maclaurin's series. Series for exponential, trigonometric and logarithmic functions

#### Multivariable Calculus: Differentiation

**Teaching hours: 7**

Limit, continuity and partial derivatives, total derivative and chain rule, Euler's theorem, Taylor's series in two variables, Tangent plane and normal line, Maxima, minima and saddle points Method of Lagrange multipliers

#### Multivariable Calculus: Integration

**Teaching hours: 9**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities).

#### Ordinary Differential Equations

**Teaching hours: 10**

Second order linear differential equations with constant coefficients, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties

#### Partial Differential Equations: First Order

**Teaching hours: 5**

First order partial differential equations, solutions of first order linear and non-linear PDEs

### Tutorials

This shall consists of at least 8 tutorials (TA) based on the syllabus

### Self-Study

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

### **Suggested Readings:**

1. G B Thomas and R L Finney, Calculus and Analytic geometry; Pearson
2. T Veerarajan, Engineering Mathematics; McGraw-Hill
3. B V Ramana, Higher Engineering Mathematics; McGraw-Hill
4. N P Bali and M Goyal, A text book of Engineering Mathematics; Laxmi Publications
5. B S Grewal, Higher Engineering Mathematics; Khanna Publishers
6. E Kreyszig, Advanced Engineering Mathematics; John Wiley & Sons
7. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems; Wiley India
8. S L Ross, Differential Equations; Wiley India
9. E A Coddington, An Introduction to Ordinary Differential Equations; Prentice Hall India
10. E L Ince, Ordinary Differential Equations; Dover Publications
11. G F Simmons and S G Krantz, Differential Equations; McGraw Hill

L = Lecture, T = Tutorial, P = Practical, C = Credit

**Nirma University  
Institute of Technology  
Bachelor of Technology  
(A.Y. 2018 – 19)**

L	T	P	C
2	0	4	4

<b>Course Code</b>	<b>2ME101/ME103</b>
<b>Course Title</b>	<b>Engineering Graphics</b>

**Course Learning Outcomes (CLO):**

After successful completion of the course, students will be able to-

1. explain the fundamental principles of engineering graphics and related drawing standards,
2. illustrate the various methods of producing and presenting graphic information,
3. make use of engineering graphics for communication using traditional means and the computer aided tools,
4. develop capability to visualize and represent geometry in two dimensions and in three dimensions,
5. summarize the role of engineering graphics in various engineering disciplines.

**Syllabus:**  
**30**

**Teaching hours:**

**UNIT - I** **02 hours**

**Introduction to Engineering Drawing**

Importance and applications of engineering drawing for various branches of engineering, drawing instruments, BIS Code of Practice, Lines, Lettering and Dimensioning, Scales, basic geometrical construction, Sheet Layout

**UNIT-II** **04 hours**

**Engineering Curves**

Construction of Conics by different methods, construction of cycloid, epicycloid and hypocycloid, construction of involutes, constructions of archimedean spiral and helix.

**UNIT-III** **14 hours**

**Solid Geometry**

Principle of Orthographic Projections, projections of points, projections of straight lines, projections of planes, projections of regular solids and sections of regular solids.

**Developments of Surfaces**

Development of lateral surfaces of regular solids (prism, pyramid, cone, cylinder) by parallel line method / radial line method.

**UNIT-IV** **05 hours**

**Orthographic Projections**

Conversion of pictorial views into orthographic projections including sectional orthographic projections.

**Isometric Projections**

Conversion of orthographic views into isometric projections / views.

## UNIT-V

05 hours

### Computer Aided Drafting

Understanding of GUI (Graphical User Interface) of drafting software, demonstration of use of available Drawing Commands, Modifying / Editing commands, Annotation and Dimensioning Commands, Concepts of Layers, demonstration of various line styles and construction of drawings in soft form using drafting software.

### Conventional representation

Symbols for standard machinery components such as nuts, bolts, locking devices, riveted and welded joints, foundation bolts. Symbols used in electrical, electronics and civil engineering

### Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### Laboratory Work:

Laboratory work will be based on the above syllabus with equal emphasis on use of drafting software and drawing sheets.

### Suggested Readings:

1. Bhatt, N. D., Engineering Drawing, Charotar publication
2. John, K. C. Engineering Graphics, PHI Publication.
3. Luzzader, W. J. and Duff, J. M. Fundamentals of Engineering Drawing, PHI publication.
4. Bethune, J. D. Engineering Graphics with AutoCAD®, PHI Publication.
5. IS SP 46: 2003. Engineering Drawing Practices for Schools and Colleges.

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**NIRMA UNIVERSITY**  
**Institute of Technology**  
**(B. Tech. All Programmes)**  
**(Semester I/II)**

L	T	P	C
0	0	2	1

<b>Course Code</b>	<b>ME104/2ME102</b>
<b>Course Title</b>	<b>Mechanical Workshop</b>

**Course Learning Outcomes (CLO):**

After successful completion of the course, students will be able to-

1. explain the safety measures required while working in the mechanical workshop,
2. interpret an engineering drawing for the given practice job,
3. select and make use of proper hand tools for a given job,
4. develop an understanding of various workshop practices.

**Course Outline:**

- (a) Instruction / demonstration shall be given for each of the following shops/trades with regards to the materials, tools and equipment used: **10 hours**

1. Introduction to Mechanical Workshop Practice
2. Joining process
3. Plumbing
4. Fitting
5. Sheet metal work
6. Carpentry
7. Black smithy
8. Use of conventional and CNC machines

- (b) Exercise and Term work: Each student is required to prepare a job in the following trades: **20 hours**

1. Arc Welding
2. Fitting
3. Carpentry
4. Black smithy

**Suggested Readings:**

1. H S Bawa, Workshop Practice -I and II by, TMH Publication.
2. K C John, Mechanical Workshop Practice by, PHI Publications.

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**Learning Outcome:**

- Students will get acquainted with basic components and capabilities of a typical computing system.
- Students will be able to critically think about basic problems and develop algorithms to solve, validate and verify with computing systems.
- Students will be able to identify appropriate language constructs and approach to computational problems.
- Students will be acquainted with coding standards including documentation which are required to be used for the development of effective, efficient and maintainable programs.

**Syllabus:**

**Introduction to Computer Systems:** Basic computer organisation, operating system, editor, compiler, interpreter, loader, linker, program development.

**Data Storage and Operations:** Various data representation techniques, data types, constants, variables, arrays, various arithmetic and logical operations in a typical programming environment.

**Algorithms and Flow charting:** Introduction to computer problem solving, concepts and algorithms and flow chart, tracing of an algorithms.

**Algorithm to Program :** Specifications, top down development and stepwise refinement as per programming environment needs. Imperative style of correct and efficient programming, introductory concepts of time and space complexities.

**Loops and Controls Construct :** conditional and unconditional execution. Simple versus nested controls. Various aspects of repetitive executions, iterative versus recursive programming styles, assertions and loop invariants.

**Errors and Debugging:** Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory.

**Structured Programming:** Introduction to modular approach of problem solving, concepts of procedure and functions for effective programming.

**Coding Conventions:** Variable naming, function naming, indentation, usage and significance of comments for readability and program maintainability.

**Laboratory Work:**

Above concepts are to be implemented in any High Level Programming Language (preferably C-language) atleast 10 experiments are to be carried out.

**References:**

1. Joyce Farrell, Programming Logic and Design Comprehensive, Cenage Learning
2. Dromey R.G., How to solve it by computers, Prentice Hall of India
3. Jean-Paul Tremblay, Richard B. Bunt, Introduction to Computer Science, McGraw Hill
4. Kernighan., Ritchie, ANSI C Language, Prentice Hall of India

5. Sedgewick R., Algorithms in C, Addison Wesley
6. Yashwant Kanitker, Let Us C, BPB Publications
7. Schaum Ourline Series, Programming in C, , McGraw-Hill
8. V. Rajaraman, Fundamentals of Computers, Prentice Hall of India

**Learning Outcome:**

The course is designed to introduce to a novice about the fundamentals of the electrical engineering. At the end of the course, it is expected that student will be able to express the behavior of basic electrical components like resistor, inductor and capacitor under DC and AC application. The students are exposed to single-phase and poly-phase systems and circuits and shall be able to comprehend the same. The student will be able to appreciate safety requirements and usage of safety devices. The learner will be able to understand and apply the basics of electrical engineering in their respective field of engineering.

**Syllabus:****Review of DC Circuits**

Resistor, temperature effect on resistance, Kirchhoff's laws, solution of series-parallel and star-delta circuits, Joule's law of electric heating, relationship between various energy units, types of capacitor, charging and discharging of capacitor, fundamentals of magnetic circuits, fringing effect, series-parallel magnetic circuits, comparison between electric and magnetic circuit

Skill Dev

Employability

**Electromagnetic Induction**

Faraday's laws of electromagnetic induction, concept of induced emfs, coefficient of coupling, series-parallel connection of inductors, rise and decay of current in inductive circuit, hysteresis and eddy current loss

Skill Dev

**Single-phase AC Circuits**

Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, Steady state analysis of R, L, C series and parallel circuits, power triangle, resonance in series and parallel circuits

Skill Dev

**Three-phase AC Circuits**

Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities, introduction to rotating vector, power measurement in three-phase circuit, solution of balanced and unbalanced systems

ENTRE

**Domestic and Industrial Wiring**

Basic domestic wiring methods, types of cable, accessories, PVC conduit and PVC casing, salient features of industrial wiring, consideration on cross sectional area and insulation strength based on voltage and current rating, design calculations, protective systems, Indian standard wiring practices

Skill, employa

**Electrical Safety and Protection**

Safety, electric shock, safety protections in electrical laboratory, methods of earthing, protective devices - fuses, MCB, ELCB and relays

Skill Dev

**Batteries**

Different types of batteries, need of batteries, charging and discharging of batteries, methods of charging

**Laboratory Work:**

This shall consist of at least 10 practicals based on the above syllabus.

**References:**

1. Electrical Technology, Volume I – B.L. Theraja, A.K. Theraja; S. Chand & Co.
2. Basic Electrical Engineering – A. E. Fitzgerald, Arvin Gabel, David E. Higginbotham, TMH Publishing Co.
3. Elements of Electrical Engineering – U. A. Patel, Mahajan Publishing House, Ahmedabad.
4. Basic Electrical Engineering – I. J. Nagrath, TMH Publishing Co. Ltd.
5. Principles of Electrical Engg.– Vincent Del Toro, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Electric Wiring – Mr. S. Samaddar, New central book agency (P) Ltd., Calcutta.
7. Electrical Design Estimating and Costing – Surjit Singh, Dhanpat Rai & Sons.

## HM102, English (Foreign Language)

[2 0 2 3]

### Course Learning Outcome:

By the end of this course

- Student will be able to understand and speak a new language
- Student will be more aware about the world outside
- It will add to the knowledge of culture other than their own
- Multi-Linguistic skills will equip them with better communication skills too

### Syllabus of English Language:

The course content will encompass following topics

#### Grammar

- Tenses
- Helping and Modal auxiliary verb
- Concords
- Prepositions
- Idioms
- Synonyms –Antonyms
- Confusables

#### Prose

- Open Window by Saki
- A Cup of Tea by Katherine Mansfield
- The Piece of String by Guy De Maupassant
- Text of Steve Jobs' Commencement address -2005
- How to be an Alien by George Mikes

#### Poems

- Ode to the skylark – by P B Shelley
- Where The Mind Is Without Fear - by Rabindranath Tagore.
- The Road Not Taken- Robert Frost
- On The Move - by Thom Gunn.

#### Methodology:

Readings, exercises, role plays, videos will be the basic tools for teaching

**As the course on foreign language will be offered by different experts, depending on the availability of the experts and demand, the syllabus of the offered foreign language will be approved by the Dean time-to-time before start of the every semester.**

#### References:

1. Leech Geoffery and Svartik Jan, 'A Communicative Grammar of English', Pearson pub.
2. Murphy Raymond, 'Grammar in Use Intermediate with Answers', Cambridge University Press
3. Selected text in the form of handouts.

## HM111 French Language (Foreign Language)

[2 0 2 3]

### Course Learning Outcomes:

At the end of the 40 hours course, students will be evaluated on the basis of 4 competences:

- Writing (Filling forms, post cards, small emails, messages),
- Speaking (To present oneself in details, to be able to ask questions in certain given situations, Role Play),
- Written Comprehension (Small texts, post cards, messages),
- Oral Comprehension (Understanding the basic day to day conversations).

### Pedagogy: Communicative and Action Oriented Approach

Supplementary:

Cultural activities of Alliance Française d'Ahmedabad.

### COURSE CURRICULUM

Main guidelines

- 1) To introduce oneself
- 2) To ask information about someone
- 3) To count
- 4) To **communicate** in a class
- 5) To Greet
- 6) To take leave
- 7) To ask personal information
- 8) To **ask politely**
- 9) To **give personal information**
- 10) To ask the price
- 11) To ask about likings
- 12) To express about our likings
- 13) To talk about a city
- 14) To name and find out different places in a city
- 15) To **ask and give an explanation**
- 16) To thank and to reply
- 17) To write a message
- 18) To give impressions about a place
- 19) To talk about ones' activities
- 20) To say where we live
- 21) To talk about the weather
- 22) To fix or postpone a meeting
- 23) To talk briefly about oneself
- 24) To ask the time and the timings
- 25) **Telephonic conversation**
- 26) To talk about the family
- 27) To talk about seasons
- 28) To understand simple information about the weather
- 29) To appreciate
- 30) To precise the quantities
- 31) With relevant **vocabulary and grammar** points.

**Course Learning Outcomes :** On completion of the course, the student would be able to:

- understand & convey expressions associated with everyday routine and topics related to direct circumstances and common requirements in Germany (e.g. seeking and sharing personal information, handling simple conversations related to shopping, making reservations, ordering in restaurants, airports, banks, railway stations, universities and other all such public places).
- get an insight into the day-to-day socio-economic culture of Germany.
- appreciate a foreign culture and the importance of learning a foreign language.
- understand and put basic German grammar such as various types of verbs, nouns, adjectives, tenses and cases to practical & functional use.
- read, write, speak and understand elementary German and be able to hold simple, short conversations confidently.

**Themes & Topics Covered:**

1. German Greetings & Good-bye's
2. Introduction (Seeking introductions & introducing yourself thoroughly in German)
3. Orientation: Learning directions & interpreting city plans (Finding your way in the city, inquiring about places, communicating with localities, making basic conversations in Post Offices, Airports, Railway Stations & public places)
4. Learning Countries, States & Capitals
5. Professions
6. Making reservations: Hotels, Taxis & other such routine bookings
7. Placing order in Restaurants & learning to find your way around routine requirements
8. Learning time, dates, days of the week, numbers & occasions/festivals.

**Grammar Covered:**

Nouns- In depth study of nouns, with emphasis on case-specific changes

1. Verbs-Regular, Irregular, Helping, Separable & Modal verbs. All with their conjugations
2. Subjects- Nominative and accusative. Correlation between a subject & a verb
3. Cases- Nominative, accusative & dative. Effect of each on nouns & the corresponding changes
4. Articles- Definite & indefinite articles. Its impact & ultimate effect on cases
5. Sentences: Imperative, declarative, exclamatory & interrogative. Positive & negative sentence construction shall also be covered (e.g: "Ja", "doch", as well as "nein", "nicht" & "kein" respectively)
6. Concepts such as adjectives, possessive pronouns, prepositions & adverbs Sentence Construction

**Nirma University**  
**Institute of Technology**  
**Department of Mathematics & Humanities**  
**B. Tech. (All), Semester I**  
**MA101: Calculus**

[3 1 0 4]

**Learning outcomes:**

On completion of the course student

CLO1: will be able to find higher ordered derivatives and hence represent function in power series of  $(x-a)$

CLO2: will apply the knowledge of function of several variables , its derivatives in engineering problems

CLO3: will apply the knowledge of special functions(Gamma, Beta, Elliptic, Error) and its application in engineering problems

CLO4: will apply the knowledge of multiple integration and its application in engineering problems

**Syllabus:**

**Unit I: Differential Calculus** Review of limits, continuity and differentiability, Successive differentiation, Leibnitz theorem (without proof), Indeterminate forms, Taylor's and Maclaurin's expansion of single variable, Partial Differentiation, Total derivative, Chain Rule, Implicit function, Euler's theorem and its applications, Taylor's and Maclaurin's expansion of function of several variables, Maxima and Minima of function of several variables, Lagrange's method of undetermined multipliers, Jacobian.

**Unit II: Integral Calculus** Review of proper and improper integrals, Reduction formulae, Beta-Gamma functions, Error function, Tracing of curves, Rectification, Quadrature, Volume of solid of revolution, Area of surface of revolution, Double integral and evaluation, Change of order of integration, Change of variable, Triple integral and evaluation, Area using double integration, Volume as double and triple integration, Volume of solid by double integration.

**References:**

1. Thomas' Calculus(Latest edition), Pearson publication.
2. G B Thomas and R. L. Finney, Calculus and Analytic Geometry (Latest edition), Narosa Publication, Delhi.
3. James Stewart, Calculus (Latest edition), Thomson Learning.
4. B. S. Grewal, Higher Engineering Mathematics, (Latest edition) Khanna publication, Delhi.
5. Dr. K. R. Kachot, Higher Engineering Mathematics Vol I (Latest edition), Mahajan Publication, Ahmedabad.
6. Sharma and Yeolekar, Engineering Mathematics Vol. I. (Latest edition), PHI, New Delhi.

## Physics (PY101/PY102)

[L T P C 2 0 2 3]

### Learning outcome:

By studying following topics of syllabus, students will be able to

- understand advanced topics of physics like characterization and applications of nanomaterials, various mechanisms and applications of laser and different measurement techniques of physical quantities.
- Experiments related to the syllabus will give the empirical understanding of the subject.

### Physics of Nanomaterials:

Introduction to Quantum Physics: Particle in a three dimensional box, Introduction - Nanoscale; Nanomaterials: Methods for synthesis of nanomaterials, Properties of nanomaterials – Electrical and Magnetic properties, Structural properties (Scanning Electron Microscopy, Tunneling Electron Microscopy); Nanostructures, Carbon nanotubes – characteristics and applications, Reduction of dimensionality - Nanostructures; Nanotechnology and environment.

### Lasers and Holography:

Introduction, Basics of Interaction of radiation with matter, Condition for light Amplification, Population inversion and metastable state, pumping, the principle pumping scheme: Three and Four level scheme, Construction and working of optical resonator, Optical amplifier, Applications of laser beam, Holography.

### Introduction to Fiber Optics:

Introduction of fiber-optic system, Principle and construction of fiber cable, Acceptance angle and numerical aperture, Types of Optical fiber: Based on material & based on mode of propagation, Index profile, Fiber optic communication link, Fiber optic sensor, Advantages of fiber optic system.

### Nuclear and Plasma Physics:

Introduction to nuclear physics, types of nuclear reactions, nuclear reaction cross sections, Radius of Gyration, particle accelerators - pinch of synchrotron radiation, nuclear fission as a source of energy, Types of nuclear reactors - Breeder reactor, power reactor, pressurized water reactor.

Basic concepts of Plasma physics - Motion of charged particle in E and B homogeneous and inhomogeneous fields, Pinch effect, Drift velocity in a gravitational field, Magnetic trapping of plasma, Van Allen radiation belt.

### Physics of Vacuum Techniques and Cryogenics:

Creation of vacuum with different pumps-rotary pump, diffusion pump, Measurement of vacuum with different gauges; Need of vacuum in Plasma unit, Cryogenics - use of liquid Nitrogen and liquid Helium, Applications of cryogenics - refrigeration in space, medical applications.

### Engineering of Auditorium and Ultrasonics:

Introduction, Defection due to reflection of sound, Sabine's empirical formula, Reverberation theory, Eyring's equation, Acoustical defects and their remedies, Acoustic materials, Ultrasonic waves, Piezo electric method, Properties and application of ultrasonic waves, Magnetostriction method.

### Laboratory Work:

A minimum of 10 experiments based on above syllabus will be arranged.

### References:

1. M N Avadhulu and P. Kshirsagar, A Text Book of Engineering Physics, S Chand Publication.
2. T. Pradeep, Nano: The Essentials, New Central book Agency.
3. S. N. Goswami, Elements of Plasma Physics, Tata McGraw Hill publication.
4. Modern Physics for Engineers by B. L. Theraja, S Chand Publication.



**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology – Civil Engineering**  
**Semester- III**

L	T	P	C
3	0	2	4

<b>Course Code</b>	2CL301
<b>Course Name</b>	Structural Mechanics-I

**Course Outcomes:**

At the end of the course, students will be able to –

1. analyse statically determinate structures subjected to gravity and lateral loading
2. calculate stresses for structures like dam, chimney, retaining wall etc.
3. illustrate behaviour of structural elements through experimentation.

**Syllabus:**

**Teaching hours: 45**

**Unit-1: Analysis of Determinate structures**

**Hours: 18**

Stability and determinacy of Structures, Principle of Superposition, Review of free body diagrams, Computation of internal forces in statically determinate beams and plane frames, Differential equation of elastic curve of beam, Computation of Slope and Deflection of determinate structures - Double Integration method, Maculay's Method, Moment Area Method.

**Unit-2: Energy Principles**

**Hours: 10**

Resilience, strain energy in tension, shear, bending, torsion, proof-resilience, modulus of resilience, impact, sudden loads and shock loading, Virtual work- Unit load method, Maxwell - Betti's theorem, Castigliano's theorem.

**Unit-3: Direct and Bending Stresses**

**Hours: 06**

Structures subjected to eccentric loads, middle third rule, kernel of the section, Analysis of structures such as dam, chimney, retaining walls etc. subjected to lateral load.

**Unit-4: Columns and Struts**

**Hours: 05**

Standard cases of end conditions and corresponding effective length, buckling, radius of gyration, principle axes, Euler's and Rankine's formula.

**Unit-5: Cable and Arches**

**Hours: 06**

Equilibrium of light cable, uniformly loaded cables at same level and at different levels, analysis of the three-hinged arches.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings:**

1. Junnarkar, S. B., & Shah, H. J., *Mechanics of Structures, Vol. - I & II*, Charotar Publishing House Pvt. Limited.
2. Vazirani, V.N., Ratwani, M. M., & Duggal, S. K. *Analysis of Structures, Vol.-I & II*, Khanna Publisher.
3. Megson, T.H.G., *Structural and Stress Analysis*, Butterworth - Heinemann.
4. Hibbeler, R. C. *Structural Analysis*, Pearson Education.
5. Kassimali, A., *Structural Analysis*, Cengage Learning India Pvt. Ltd.
6. Menon, D. *Structural Analysis*, Narosa Publishing.
7. Reddy, C. S. *Basic Structural Analysis*, Tata McGraw-Hill.

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w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
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**Bachelor of Technology - Civil Engineering**  
**Semester – III**

L	T	P	C
3	0	2	4

<b>Course Code</b>	2CL302
<b>Course Name</b>	Surveying

**Course Outcomes:**

At the end of the course, students will be able to -

1. apply the knowledge of different survey methods for preparation of plan or map
2. calculate distance, angle, height, earthwork etc. from accurate recorded field data
3. acquire knowledge of modern survey systems such as total station, GIS, GPS, RS etc.
4. lay out any civil engineering structure on field.

**Syllabus:**

**Teaching hours: 45**

**Unit 1 - Introduction to Surveying:**

**Hours: 05**

Definition, objective, principle of surveying, types and methods, scales and map, errors and adjustment, coordinate system.

**Unit 2 - Linear and Angular Measurement:**

**Hours: 08**

Taping, bearing, calculation of angle from bearings, Theodolite Traverse Survey: theodolite types, measurements of horizontal and vertical angle, theodolite traverse survey and adjustment.

**Unit 3 - Levelling and Contouring:**

**Hours: 07**

Types of level, principle of levelling, types of levelling, errors, Contouring, Characteristics of Contours, Methods of Plotting Contours, Calculation of area and volume.

**Unit 4 - Survey Methods:**

**Hours: 06**

Tacheometry: objective, principles and types. Plane table survey: objective, instruments and methods.

**Unit 5 - Application of Surveying in Construction:**

**Hours: 03**

Setting out of building, bridges, culverts etc.

**Unit 6 - Curve Setting:**

**Hours: 06**

Elements of simple circular curve, reverse curve, compound curve, transition curve and vertical curves, method of setting out.

## Unit 7 - **Advanced Surveying Techniques**

**Hours: 10**

Total station, EDM, introduction to photogrammetry, GPS survey, introduction to GIS, Remote sensing, LIDAR.

### **Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

### **Suggested Readings:**

1. Subramanian, R. *Surveying and Levelling*, Oxford Higher Education.
2. Anderson, J.M. & Mikhali, E.M. *Surveying: Theory and Practice*, McGraw-Hill Publishing.
3. Gopi S., Sathikumar, R., & Madhu, N. *Advanced Surveying*, Pearson Education, New Delhi.
4. Punmia, B.C. *Surveying and Levelling, Vol. I & II*, Laxmi Publications Pvt. Ltd., New Delhi.
5. Duggal, K. S. *Surveying and Levelling, Vol. I & II*, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
6. Basak, N. N. *Surveying and Levelling*, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
7. Chandra, A.M. *Higher Surveying*, New Age International Publishers, New Delhi.

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w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
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**School of Engineering**  
**Bachelor of Technology – Civil Engineering**  
**Semester- III**

L	T	P	C
2	0	4	4

<b>Course Code</b>	2CL303
<b>Course Name</b>	Construction Materials

**Course Outcomes:**

After successful completion of the course, student will be able to

1. examine properties of materials related to civil engineering
2. apply measures to assess quality of concrete and its ingredients in the field and laboratory
3. evaluate and select appropriate construction materials for intended applications.

**Syllabus**

**Teaching hours: 30**

**Unit 1: Civil Engineering Materials**

**Hours: 10**

Timber: industrial timber, plywood, seasoning, defects, tests  
 Metals; ferrous and nonferrous metals, properties, tests  
 Paints and Glass: Classification, properties, application, uses  
 Stones and Aggregates: criteria, classification, properties, tests  
 Lime: classification, manufacturing, preservation and storage, tests  
 Bricks and Blocks: classification, manufacturing of clay bricks, tests, blocks.  
 Cement: manufacturing process, hydration of cement, types, tests,  
 Plastic and Polymer: types, applications.  
 Advances in civil engineering materials; selection of building materials incorporating sustainability aspects

**Unit 2: Concrete**

**Hours: 20**

Fresh and hardened concrete, workability, role of admixtures, quality control, maturity of concrete, concrete mixture design, Parameters affecting strengths and durability, Non-destruction testing

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **Laboratory Work:**

Laboratory work based on above syllabus with minimum 15 experiments to be incorporated.

### **Suggested Readings:**

1. Shetty, M.S., Concrete Technology, Theory & Practice, S. Chand and Co.
2. Gambhir, M.L., & Jamwal, N. Building and Construction Materials: Testing and Quality Control, Tata McGraw Hill.
3. Neville, A.M. Properties of Concrete, Longman Publishers.
4. Mehta P. K., & Montiero P. M. J. Concrete Material, Microstructure and Properties, McGraw-Hill.
5. Varghese, P.C. Building Material, Prentice-Hall of India.
6. Duggal, S.K. Building Materials, New Age International.

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w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
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**Bachelor of Technology – Civil Engineering**  
**Semester- III**

L	T	P	C
0	0	4	2

<b>Course Code</b>	2CL304
<b>Course Name</b>	Civil Engineering Drawing and Building Planning

**Course Outcomes:**

At the end of the course, students will be able to –

1. interpret civil engineering drawings
2. apply principles of planning and building Bye-laws
3. plan a residential and public buildings and create perspective drawing
4. develop 2-dimensional and 3- dimensional drawing using CAD tools.

**Syllabus:**

**Laboratory Hours: 60**

**Unit-1: Introduction to building drawing and building system**

**Lab Hours: 06**

Definition, Need and importance of drawing in civil engineering, graphical and numerical scale, lines, lettering and dimensioning, introduction of plan, elevation and section, classification of buildings, building components, conventional signs, symbols and abbreviations

**Unit-2: Introduction to drafting tools and CAD modelling**

**Lab Hours: 08**

Review of computer aided drawing (CAD), drawing presentation norms and standards, 2D and 3D CAD commands, conversion of 2D drawing in 3D models using CAD commands

**Unit-3: Residential building planning & Bye Laws**

**Lab Hours: 14**

Architectural principle, principles of planning, modular planning concept, sustainability in planning of building, Objectives, importance of bye-laws, introduction of NBC, F.S.I, provisions for differently abled persons, plan approval process

**Unit-4: Submission and detailed drawing**

**Lab Hours: 14**

Submission drawing: plan, elevation and section of the building, development of detailed plan from line diagram, key plan, site plan, structural drawing, foundation plan, furniture arrangement, sanitary, plumbing & electrical layouts etc.

**Unit-5 Public buildings****Lab Hours: 12**

Functional Planning and layout of Public building : educational institute, hospital, hotel, industrial building.

**Unit-6: Perspective drawing****Lab Hours: 06**

Elements of perspective drawing: Introduction, One-point and two-point perspective drawing.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments/exercise to be incorporated.

**Suggested Readings:**

1. Shah, M. G., Kale, C. M., & Patki, S. Y. *Building Drawing with an integrated approach to Built Environment*, Tata McGraw-Hill.
2. Zaidi S.K.A., & Siddiqui S. *Drawing and Design of Residential and Commercial Buildings*, Standard Publishers.
3. Raja Rao, Y. N. *Planning and Designing of residential building*, Standard Publishers.
4. Sharma S. C. & Singh G. *Civil Engineering Drawing*, Standard Publishers.
5. Prabhu Balagopal, T. S. *Building Drawing and Detailing*, Spades Publishers, Calicut.
6. Sikka, V.B. *A Course in Civil Engineering Drawing*, S.K.Kataria and Sons.
7. National Building Code of India, Bureau of Indian Standards.
8. Comprehensive General Development Control Regulations, AUDA, Ahmedabad, 2017.

L= Lecture, T= Tutorial, P= Practical, C= Credit

w.e.f. academic year 2019-20 and onwards



**NIRMA UNIVERSITY**  
**Institute of Technology**  
**Bachelor of Technology – Civil Engineering**  
**Semester III**

L	T	P	C
3	1	0	4

<b>Course Code</b>	<b>2MA302</b>
<b>Course Title</b>	<b>Applied Mathematics for Civil Engineering</b>

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to-

1. comprehend and solve the real life application of differential equations
2. apply numerical techniques for civil engineering problems
3. use statistical methods in various civil engineering problems

**Syllabus: Teaching hours:**

**Unit I 9**

**Fourier Series:** Periodic functions. Euler's formulae. Fourier expansion of periodic functions with period  $2\pi$ . Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with arbitrary periods. Half range Fourier series. Harmonic analysis

**Unit II 11**

**Modeling of Differential Equation:** Modeling of Deflection of Beams, Method of separation of variables to solve partial differential equation, Applications to Wave equation, one-dimensional heat equation and Laplace equation

**Unit III**

**Numerical Methods:** Iterative Method: Motivation, errors, truncation error, rounded off error, absolute error, relative error and percentage error, Solution of algebraic and transcendental equation by False position, Newton-Raphson iteration, Rate of convergence of the iteration methods, Comparisons of iterative methods. System of Linear Algebraic Equations: Solution of simultaneous linear equations, Gauss elimination and pivoting, ILL – Conditional equations and refinement of solutions, Gauss-Seidel iteration method. Finite Differences and Interpolation: Newton's forward and backward interpolation and Lagrange's interpolation Numerical Differentiation and Integration: Numerical differentiation, Numerical integration: Trapezoidal rule, Simpson's 1/3<sup>rd</sup> rule, Simpson's 3/8<sup>th</sup> rule, Numerical solution of ordinary differential equation: Definition, Formation, Order and degree of a differential equation, Euler's Method, Runge-Kutta method of 4<sup>th</sup> order

20

**Unit IV**

**Statistics:** Measure of Central Tendency and dispersion, Correlation, Regression

5

**Tutorials:**

This shall consist of at least 8 tutorials based on the syllabus.

**Self-Study:**

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

**Suggested Readings<sup>^</sup>:**

1. T Veerarajan, Engineering Mathematics; McGraw-Hill
2. B S Grewal, Higher Engineering Mathematics; Khanna Publishers
3. E Kreyszig, Advanced Engineering Mathematics; John Wiley & Sons
4. W E Boyce and R C DiPrima, Elementary Differential Equations and Boundary Value Problems; Wiley India
5. G F Simmons and S G Krantz, Differential Equations; McGraw Hill
6. Steven C. Chapra, Raymond P. Canale., Numerical methods for engineers Volume 1; McGraw-Hill
7. M. K. Jain and S R K Iyengar, Numerical Methods for Scientific & Engineering Computation; New Age International Publication
8. Das N, Statistical Methods; McGraw Hill

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<sup>^</sup> this is not an exhaustive list

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand various methods of surveying
- estimate distance, angle and height through different instruments
- calculate area and volume and to generate maps
- adopt appropriate survey method for field problems

**Syllabus:**

**Introduction:** Definition, objectives, uses, classification of survey, principles of surveying, introduction to map and map projection, scales and types of scale, error and types of error

**Linear Measurement:** Distance measurement devices: Chain, tape, EDM, GPS etc., corrections

**Direction and Angular measurement:** Compass, uses, types, meridians, bearings, local attraction, declination. Theodolite: Types, temporary adjustment, Measurements of horizontal and vertical Angles

**Traverse Survey:** Types of traverse, Theodolite traverse - Field work, Latitude, departure, Coordinate system of traverse, Adjustment of close traverse, other uses of theodolite

**Leveling & Contouring:** Definitions, Types of levels, methods of leveling, Booking of level books and R.L. computations, correction for curvature & Refraction, various types of leveling, contour, characteristics, methods of plotting contour, Precise leveling, Trigonometric Levelling: Definition and types

**Plane Table Survey:** Definitions, Plane table accessories, Advantages & Disadvantages, Methods of plotting - Radiation, Intersection & Traversing.

**Setting out work:** Setting out building, bridge elements, road alignment and grades, culverts etc.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 12 experiments to be incorporated.

**References:**

1. R. Subramanian, Surveying and Leveling, Oxford University.
2. B. C. Punmia, A. K. Jain & A. K. Jain, Surveying Vol. I, Laxmi Publications.
3. A. M. Chandra, Plane Surveying, New Age International.
4. S. K. Duggal, Surveying Vol. I, Tata Mcgraw-Hill.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand properties and role of ingredients like cement, aggregate, admixtures etc. to produce better quality concrete
- execute experiments related to concreting ingredients & mapping of data with codal stipulations
- apply design mix concepts to produce concrete with adequate strength and durability
- perform destructive, semi-destructive and non-destructive tests for concrete
- demonstrate advancements in concreting materials and techniques

**Syllabus:**

**Introduction:** Concrete as a building material, advantages over conventional building materials.

**Concrete Ingredients:** Role of different ingredients, Cement; Manufacturing, Types, suitability of different cements, properties, Hydration process; Aggregates : various types, suitability, properties; Water: Role on concrete properties, quality; Admixtures ; Various Natural & factory made additives, Role of Mineral admixtures, chemicals :Accelerating, Retarding, plasticizers, Super-plasticizers & grouts.

**Fresh Concrete:** Properties & their measurement, quality control, role of equipment in producing good concrete, concept of maturity.

**Hardened Concrete:** Properties and their measurement, Dimensional stability- Elasticity, shrinkage & creep, Durability- Carbonation, sulphate attack, acid attack etc., testing of concrete on samples and testing of concrete in structure- Destructive, semi-destructive & non-destructive tests.

**Mix Design:** Concrete mix requirements, effect of w/c, statistical quality control, principles, mix with & without admixtures using different Codes.

**Special Techniques:** Extreme weather concreting, mass concreting, pumped concrete, underwater concreting, grouting, guniting and shot-creting. Fiber reinforced concrete and ferro cement.

**Advances in Concrete:** Architectural concrete, Pre-packed concrete, light weight structural concrete, High Strength, High Performance Concrete, High density concrete, Polymer concrete, Ready mix concrete etc.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 13 experiments to be incorporated.

**References:**

1. A. M. Neville, Properties of Concrete, Pearson Education Asia.
2. M. S. Shetty, Concrete Technology, S. Chand & Company.
3. M. L. Gambhir, Concrete Technology, Tata McGraw-Hill.
4. P. Kumar Mehta and P J M Monterio, Concrete Microstructure, Properties & Materials, Tata McGraw-Hill.
5. IS Codes: IS 456, IS 10262.

**Nirma University**  
**Institute of Technology**  
**Department of Mathematics & Humanities**  
**B. Tech. Semester: III ( CL )**  
**Subject: MA302 Engineering Mathematics**

[ 3 1 – 4 ]

**Learning Outcomes:**

1. Ability to express physical phenomenon in mathematical formulation
2. Ability to understand and solve differential equations
3. Basic knowledge of widely used numerical techniques and their applications
4. Exposure to statistical methods and data analysis with reference to Civil Engineering.

**Differential Equations & Fourier series:**

Fourier Series: Periodic functions. Euler's formulae. Fourier expansion of periodic functions with period  $2\pi$ . Dirichlet's conditions. Fourier series of even and odd functions. Fourier series of periodic functions with arbitrary periods. Half range Fourier series. Harmonic analysis.

Differential Equations: Definition. Formation of Differential equation. Equations of first order & first degree. Variable separable. Homogeneous equations. Linear differential equation. Bernoulli's equation. Exact equation. Equation reducible to exact equation. Equation of the first order and higher degree. Clairaut's equation. Linear differential equation of higher order. Rules for finding complementary function. Rules for finding particular integrals - Method of undetermined coefficients; Method of variation of parameter. Cauchy's & Legendre's equation. Simultaneous linear differential equation. Application in Civil Engineering.

**Partial Differential Equations:** Formation of Partial differential equations, Directly integrable equations, Lagrange's equation. Method of separation of variables. Applications to the Wave equation, one-dimensional heat and Laplace equation.

**Numerical Methods:**

Iterative Method: Motivation, errors, truncation error, rounded off error, absolute error, relative error and percentage error, Solution of algebraic and transcendental equation by bisection, False position, Secant, Newton-Raphson iteration and extended iteration methods, Rate of convergence of the iteration methods, Comparisons of iterative methods.

**System Of Linear Algebraic Equations:** Solution of simultaneous linear equations, Gauss elimination and pivoting, III – Conditional equations and refinement of solutions, Gauss-Seidel iteration method.

**Curve fitting:** Method of least squares

**Self Study :**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorials :**

This shall consist of solution of at least 8 tutorials (TA) based on the above syllabus.

**Books:**

1. Advanced Engineering Mathematics, E. Kreyszig, Wiley India
2. Numerical Methods in Engineering and Science, B. S. Grewal, Khanna Publishers
3. Numerical methods for engineers Volume 1, Steven C. Chapra, Raymond P. Canale, McGraw-Hill Publishers.

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**B. Tech - All Branches**  
**Semester III/IV**

L	T	P	C
2	0	0	2

<b>Course Code</b>	<b>2HS341</b>
<b>Course Title</b>	<b>Principles of Management</b>

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to-

- interpret the various theories and processes of management
- relate with different functional areas of management
- appreciate the role and need of managers in different organisations

**Syllabus: Teaching hours:**

**Unit I 8**

**Nature of Management:** Concept, Significance, Role & Skills, Levels of Management, Concepts of POSDCORB (Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting). Overview of Decision making. Evolution of Management thoughts, Contribution of F.W Taylor, Henri Fayol and Contingency Approach. Overview of Indian thoughts on Management, Management by Objectives (MBO)

**Unit II 4**

**Planning:** Meaning, Importance, Elements, Process

**Unit III 6**

**Organizing:** Concepts, Structure (Formal & Informal, Line & Staff and Matrix), Meaning, Advantages and Limitations of organizing. Departmentation: Meaning, Basis and Significance, Span of Control: Meaning, Factors affecting span of Control, Centralization vs. Decentralization, Delegation: Authority & Responsibility relationship

**Unit IV 6**

**Directing, Co-ordination and Controlling:** Leading : Concept of leadership, Directing: Meaning and Process, Co-ordination as an Essence of Management, Controlling: Meaning, Process and Technique

**Unit V 6**

**Functional Management:** Introduction to different functional aspects of management- Finance, Operations, Marketing, Human Resource and Strategic Management

**Self-Study:**

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents

**Suggested Readings^:**

1. Koontz & Wehrich, Essentials of Management; Tata McGraw Hill

2. Tripathy & Reddy , Principles of Management; Tata McGraw Hill
3. Kreitner & Mohapatra, Management ; Biztantra
4. Robbins , Decenzo & Coulter, Fundamentals of Management; Pearson Education
5. Stoner, Freeman & Daniel R Gilbert, Management; Pearson Education
6. Robbins & Coulter, Management; Prentice Hall (India) Pvt. Ltd

L = Lecture, T = Tutorial, P = Practical, C = Credit

^ this is not an exhaustive list

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**B. Tech. - All Branches**  
**Semester III/IV**

L	T	P	C
2	0	0	2

<b>Course Code</b>	<b>2HS342</b>
<b>Course Title</b>	<b>Principles of Economics</b>

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to-

1. interpret the various basic economic principles
2. relate the economic fundamentals with engineering practices
3. infer the macro-economic aspects of engineering projects

**Syllabus:**  
**hours:**

**Teaching**

<b>Unit I</b> <b>Basic Economic Concepts:</b> Needs, wants, means/resources – marginal principle and economic efficiency, trade - off, opportunity cost, rationality, externalities, differences between micro economics and macro economics	<b>3</b>
<b>Unit II</b> <b>Demand and Supply:</b> Meaning and determinants of demand and supply, law of demand and law of supply equilibrium between demand and supply.. The concept of elasticity – meaning and types	<b>3</b>
<b>Unit III</b> <b>Production, Cost and Revenue:</b> Production function, law of variable proportion and laws of returns to scale, different types of costs – variable cost, fixed cost, total cost, average cost, average fixed cost, average variable cost and marginal cost, Total revenue, average revenue and marginal revenue, profit function	<b>3</b>
<b>Unit IV</b> <b>Market Structures &amp; Pricing:</b> Concept of market and equilibrium-characteristics of perfect competition, monopoly, monopolistic competition and oligopoly–price determinations	<b>6</b>
<b>Unit V</b> <b>Macro-Economic Environment:</b> Basic macro- economic concepts –aggregate demand aggregate supply, money, income employment consumption savings and investment. National Income Accounting-concepts and methods of national income – recent changes in the methodology of national income accounting	<b>7</b>
<b>Unit VI</b>	



**Banking:** Meaning and functions of commercial banks and central bank 3

**Unit VII** 2

**Inflation:** Meaning, and types of inflation, Causes and effect of inflation on different sectors of the economy

**Unit VIII** 3

**International Trade:** Meaning and significance of International Trade, Cases for and against globalization. World Trade Organization (WTO) – functions and recent deliberations in World Trade Organization (WTO )

### **Self -Study:**

The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **Suggested Readings<sup>^</sup>:**

1. Mankiw, N. G. Principles of Economics. Mason, USA: South-Western Cengage Learning.
2. Samuelson P. A. & Nordhaus, W.D. Economics. India: Tata McGraw Hill Education.
3. Pindyck, R.S., Rubinfeld, D. L. & Mehta, P. L. Micro Economics. New Delhi, India: Pearson.
4. Ahuja H.L. Modern Economics. New Delhi, India: S. Chand & Company Ltd.
5. Dornbusch, R., Fisher, S, & Startz, R. Macro Economics. India: Tata McGraw Hill Education.
6. Gupta, G. S. Macro Economics Theory and Applications. India: Tata McGraw Hill.

L =Lecture, T =Tutorial, P= Practical, C=Credit

<sup>^</sup> this is not an exhaustive list

**Course Learning Outcome (CLO):**

After successful completion of the course, students will be able to

- understand the basic economic theory and economic way of thinking
- analyze macro - economic policies
- evaluate the economic efficiency in engineering projects

**Syllabus****Module: - 1 MICRO ECONOMICS**

1. Basic Economic Concepts: Meaning and understanding of basic economic concepts
2. Demand and Supply: Meaning and Determinants of Demand and Supply, Law of Demand and Supply, Elasticity of Demand and Supply.
3. Production Function: Meaning, production with one variable input, the law of variable proportion, the laws of returns to scale. Economies of Scale
4. Cost Function: Different types of costs, the short run and long run cost functions.
5. Market Structure: Meaning and characteristics of different types of market –
  - Perfect Competition
  - Monopoly
  - Monopolistic Competition and
  - Oligopoly

**Module-2 MACRO ECONOMICS**

6. Introduction to Macro Economics: Basic Macro Economic Concepts, National Income Accounting, Concepts of National Income and Methods of National Income Computation
7. Inflation: Meaning, types, causes, effect and remedial measures.
8. Money and Banking: Meaning and Functions of money, Money Supply, Commercial Banks and Central Bank-Meaning and Functions
9. Public Finance: Government Expenditure, Receipts, Budget and Deficits.

**Self -Study:** The self -study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Suggested Books:**

- (1) Micro Economics Robert S Pindyck, Daniel L Rubinfeld, Prem L Mehta - Pearson
- (2) Principles of Economics N.Gregory Mankiw, Thomson South Western , Pearson

- (3) Modern Economics – H.L.Ahuja – S.Chand & Company**
- (4) Macro Economics – Rudiger Dornbush, Stanley Fisher, Richard Startz – Tata Mc-Graw-Hill**
- (5) Principles of Macro Economics, C.Rangarajan and B.H.Dholakia, The McGraw Hill**
- (6) Economics , Samuelson and Nordhaus, Tata McGraw Hill**
- (7) Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore, Adapted by Ravikesh Srivastava, Oxford University Press**

**List of Journals/Periodicals/Magazines/Newspapers: Economist, Indian Economic Review, Asian Economic Review, American Economic Review, Economic and Political Weekly (EPW), Economic Times, Business Standard etc.**

**Websites Recommended: [www.finmin.nic.in](http://www.finmin.nic.in)  
[www.rbi.org.in](http://www.rbi.org.in) [www.planningcommission.nic.in](http://www.planningcommission.nic.in) etc.**

**Course Learning Outcome:**

After successful completion of this course, student will be able to

- identify various modern ICT based tools and technologies
- understand features of the tools which are useful for academic/research/application development
- use ICT based tools for programme specific applications
- understand the vulnerabilities in the system and protect themselves from the attack

**Syllabus:**

**Appropriate IT security aspect as per latest vulnerabilities and** appropriate number of tools are to be identified and studied as per programme specific needs, to be decided by the respective Course Coordinator and to be approved by Dean, FoTE before commencement of the course.

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology – Civil Engineering**  
**Semester- IV**

L	T	P	C
3	0	2	4

<b>Course Code</b>	2CL401
<b>Course Name</b>	Structural Mechanics-II

**Course Outcomes:**

At the end of the course, students will be able to –

1. analyze statically indeterminate structures subjected to gravity and lateral loadings by employing various methods
2. develop influence line diagrams for beams and trusses
3. illustrate behaviour of structural elements through experimentation.

**Syllabus:**

**Teaching hours: 45**

**Unit-1: Classical Methods for Analysis of Indeterminate structures Hours:18**

Review of Indeterminacy, Analysis of propped cantilever beams, fixed beams, continuous beams and plane frames - consistent deformation method, Slope-Deflection method, Moment Distribution method, Principle of least work.

**Unit-2: Matrix Methods Hours: 09**

Analysis of beams using flexibility method, Analysis of beam, frame and truss using stiffness system approach, Analysis of beams using stiffness member approach.

**Unit-3: Approximate Methods Hours: 08**

Approximate methods: building frames subjected to gravity and lateral loading, portal method, cantilever method, introduction to substitute frame method.

**Unit-4: Moving Loads and Influence Lines Hours: 10**

Application of influence line diagrams for determinate and indeterminate beams and trusses, Muller-Breslau principle and its application

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 08 experiments to be incorporated.

### **Suggested Readings:**

1. Junnarkar, S. B. & Shah, H. J. *Mechanics of Structures, Vol.-I & II*, Charotar Publishing House Pvt. Limited.
2. Vazirani, V. N., Ratwani, M. M., & Duggal, S. K. *Analysis of Structures, Vol.-I & II*, Khanna Publisher.
3. Hibbeler, R. C. *Structural Analysis*, Pearson.
4. Kassimali, A., *Structural Analysis*, Cengage Learning India Pvt. Ltd.
5. Megson, T.H.G., *Structural and Stress Analysis*, Butterworth - Heinemann.
6. Reddy, C. S. *Basic Structural Analysis*, Tata McGraw-hill.
7. Menon, D. *Structural Analysis*, Narosa Publishing.
8. Gere. J. M. & Weaver, W. *Matrix Analysis of Framed Structures*, C. B. S. Publishers & Distributors.
9. Norris, C. H., Wilbur, J. B. & Utku, S. *Elementary Structural Analysis*, McGraw-hill, Inc.

L= Lecture, T= Tutorial, P= Practical, C= Credit

w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology – Civil Engineering**  
**Semester- IV**

L	T	P	C
2	0	2	3

<b>Course Code</b>	2CL402
<b>Course Name</b>	Fluid Mechanics

**Course Outcomes:**

At the end of the course, students will be able to –

1. comprehend properties of fluids for civil engineering applications
2. apply kinematics and dynamics of flow for solving engineering problems
3. analyse fluid flow through close conduits and open channels.

**Syllabus:**

**Teaching Hours: 30**

**Unit-1: Pressure and its measurement**

**Hours: 04**

Review of properties of fluids, viscosity, compressibility, surface tension, & capillarity. Fluid pressure at a point, pressure variation in a fluid at rest, measurement of pressure, simple manometers, differential manometers.

**Unit-2: Hydrostatic forces on surfaces**

**Hours: 06**

Total pressure & centre of pressure, vertical, horizontal & inclined plane surface submerged in liquid, Forces on submerged body.

**Unit-3: Kinematics of flow**

**Hours: 04**

Methods of describing fluid motion, types of fluid flow, rate of flow or discharge, continuity equation in three dimensions.

**Unit-4: Dynamics of fluid flow**

**Hours: 06**

Euler's equation of motion, Bernoulli's equation & its assumptions, practical applications of Bernoulli's equation.

**Unit-5: Flow through pipes**

**Hours: 07**

Major and minor energy losses in pipes, hydraulic gradient and total energy line, flow through pipes in series and parallel, classification of orifices and mouthpiece, flow through an orifice, hydraulic coefficients.

**Unit-6: Flow in open channel**

**Hours: 03**

Classification of flow in channels, discharge through open channels by Chezy's formula.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings:**

4. Bansal, R. K. *A Text Book of Fluid mechanics & Hydraulic Machines*, Laxmi Publications.
- Ramamrutham, S. *Hydraulic Fluid Mechanics and Fluid Machines*, Dhanpat Rai.
- Rajput, R. K. *Text book of Fluid Mechanics and Hydraulic Machines*, S. Chand & Co.
- Hibbeler, R. C. *Text book of Fluid Mechanics*, Pearson
- Subramanya, K. *Fluid Mechanics and Hydraulic Machines*, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

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w.e.f. academic year 2019-20 and onwards



**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology - Civil Engineering**  
**Semester – IV**

L	T	P	C
3	0	2	4

<b>Course Code</b>	2CL403
<b>Course Name</b>	Construction Technology

**Course Outcomes:**

At the end of the course, students will be able to –

1. recognize various building components, construction activities and equipment
2. identify and select appropriate openings, roofs, flooring and types of finishes or buildings
3. recommend appropriate mode of vertical movements and building services.

**Syllabus:**

**Teaching hours: 45**

**Unit-1: Introduction**

**Hours: 02**

Buildings: Introduction, Types, Components and overview of various construction techniques

**Unit-2: Foundation**

**Hours: 05**

Requirements of excavation & foundation. Types of foundations, Underpinning, shoring and strutting for lateral restraintment of soil, dewatering and backfilling.

**Unit-3. Water Proofing and Anti- Termite Treatment**

**Hours: 02**

Need, Cause Effects and Methods of DPC and Anti-Termite treatment.

**Unit-4: Wall Construction and Form Work**

**Hours: 03**

Load Bearing, Partition, Cavity Wall, Composite Wall, Scaffolding, Shuttering for Column, Beam and Slab.

**Unit-5: Stone, Brick Masonry and Composite Construction**

**Hours: 05**

Terminologies, Types and materials of masonry constructions, bonds in masonry and construction of masonry walls, lintels, weather shed and arches.

**Unit-6: Openings in Buildings**

**Hours: 04**

Objectives, components and design of Doors, Windows & Ventilators; Types, materials, structure, construction features, manufacture and methods of installations.

**Unit-7: Vertical transportation in buildings** **Hours: 05**

Staircases: Objectives, components, specific uses, types and their suitability. Materials and their suitability for varied applications. Design considerations, planning, accommodation and design of staircases. Lifts, escalators and ramps as means of vertical transportation.

**Unit-8: Roofs and Floors** **Hours: 04**

Types of roofs, Flat, Sloping (pitched). Functional requirements, components and types of roofs. Roofing materials and suitability for varied applications. Industrial roofs and trusses. Types of floors, objectives, functional requirements and materials of floorings.

**Unit-9: Finishing Works** **Hours: 02**

Objectives and types of finishing and pointing (internal & external finishing), methods of finishing-pointing, plastering, cladding, whitewashing/distempering and painting.

**Unit-10: Acoustics and Sound Insulation** **Hours: 02**

Necessity, Characteristics, Reflection of Sound, Common Acoustical Defects and Sound Insulation.

**Unit-11: MEP Systems** **Hours: 03**

Introduction to Mechanical, Electrical and Plumbing System

**Unit-12: Construction Equipment** **Hours: 08**

Introduction, Types, Hauling Equipment, Hoisting Equipment, Drilling and Blasting Equipment, Earth Moving and Compacting Equipment, etc.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 08 experiments to be incorporated.

**Suggested Readings:**

1. McKay, W. B. *Building Construction Metric Vol. I to IV*, Orient Longman.
2. Sarkar, S.B. *Construction Technology*, Oxford University Press
3. Chudley, R., & Greeno, *Building Construction Handbook*, Butterworth Heinemann Ltd.
4. Bindra, S. P., & Arora, S. P. *Building Construction*, Dhanpat Rai.
5. Punmia, B. C. *Building Construction*, Laxmi Publications.
6. Goyal, M. M. *Handbook of building construction: The Essential Source of Construction Practice*, Amrendiya Consultancy.
7. Rangwala, S. C. *Building Construction*, Charotar Publication.

L= Lecture, T= Tutorial, P= Practical, C= Credit

w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology – Civil Engineering**  
**Semester- IV**

L	T	P	C
2	0	2	3

<b>Course Code</b>	2CL404
<b>Course Name</b>	Geotechnical Engineering

**Course Outcomes:**

At the end of the course, students will be able to –

1. appraise application of geology in civil engineering problems
2. classify soils and derive physical properties of soil
3. evaluate engineering properties of soil such as permeability, compaction and shear strength.

**Syllabus:**

**Teaching hours: 30**

**Unit-1: Engineering Geology**

**Hours: 04**

The earth as planet, scope of geology; geological studies for Engineers; Basic terminologies: folds, joints, faults, unconformities, overlap stratification, etc.

**Unit-2: Introduction to Soil Mechanics**

**Hours: 12**

Definition, formation of soil, limitations of soil mechanics; Soil as three phase system & related properties, Index properties, Consistency limits; Classification of soils; Vertical stress distribution in soil: pressure isobars.

**Unit-3: Engineering Properties of Soil**

**Hours: 14**

Permeability: definition, factors affecting permeability, measurement of permeability, soil-water properties, quick conditions; Compaction: definition, standard and modified compaction tests, factors affecting compaction, field compaction method; Shear Strength: definition, different shear tests, interpretation of results, shear strength parameters & theory, shear strength of cohesive & non-cohesive soils.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

### **Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

### **Suggested Readings:**

1. Singh, P. *Engineering & General Geology*, S. K. Kataria & Sons.
2. Ranjan, G., & Rao, A.S.R. *Basic and Applied Soil Mechanics*, New Age International Publication.
3. Das B.M. and Shobhan K. *Principles of Geotechnical Engineering*, Cengage Learning India Private Limited
4. Arora, K. R. *Soil Mechanics and Foundation Engineering*, Standard Publication.
5. Gulhati, S., & Datta, M. *Geotechnical Engineering*, Tata McGraw-Hill.
6. Bell, F. G. *Engineering Geology*, Elsevier.
7. Knappett, J. A., & Craig, R. F. *Craig's Soil Mechanics*, CRC Press.

L= Lecture, T= Tutorial, P= Practical, C= Credit

w.e.f. academic year 2019-20 and onwards

**NIRMA UNIVERSITY**  
**Institute of Technology**  
**School of Engineering**  
**Bachelor of Technology - Civil Engineering**  
**Semester – IV**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
3	0	2	4

<b>Course Code</b>	2CL405
<b>Course Name</b>	Transportation Engineering

**Course Outcomes:**

At the end of the course, students will be able to

1. comprehend basic requirements of highway, railway, harbour and airport
2. design the geometric elements of highways
3. characterize pavement materials and design pavements
4. perform traffic studies and implement traffic regulation and control measures.

**Syllabus:**

**Teaching Hours: 45**

**Unit 1: Introduction to Transportation Engineering**

**Hours: 03**

Introduction to surface, air and water transportation systems, characteristics and classification systems, public transportation in modern society.

**Unit 2: Geometric design of highways**

**Hours: 07**

Highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment.

**Unit 3: Traffic Engineering & Control**

**Hours: 06**

Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control, traffic intersections.

**Unit 4: Pavement Materials and Design of pavements**

**Hours: 12**

Introduction; Pavement materials: desirable properties, tests, requirements for different types of pavements, flexible pavements-factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.

**Unit 5: Introduction to Railway Engineering****Hours: 10**

Permanent way, Track and Track stresses, Components of a railway track, Alignment of Railway Track, Geometric Design of Track, Points and Crossings.

**Unit 6: Introduction to Airport Engineering****Hours: 04**

Airport Classification, Planning of Airport elements, wind rose and orientation of runway, basic runway length, runway patterns.

**Unit 7: Introduction to Docks and Harbour Engineering****Hours: 03**

Classification of Harbours, Principles of harbour Planning, Site selection and layout of harbours, Marine Structures.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings:**

1. Khanna, S.K., Justo, C.E.G., & Veeraragavan, A. *Highway Engineering*, Nem Chand & Bros.
2. Kadiyali, L.R. *Traffic Engineering and Transport Planning*, Khanna Publishers.
3. Chakraborty, P., & Das, A. *Principles of Transportation Engineering*, PHI Learning.
4. Chandra, S., & Agarwal, M.M. *Railway Engineering*, Oxford University Press.
5. Saxena, S.C., & Arora, S.P. *A Text Book on Railway Engineering*, Dhanpat Rai Publications.
6. Ashford, N., Mumayiz, S., & Wright, P.H. *Airport Engineering: Planning, Design, and Development of 21st Century Airports*, John Wiley & Sons.
7. Rangwala, S.C., & Rangwala, P.S. *Airport Engineering*, Charotar Publishing House.
8. Srinivasan, R. *Harbour Dock and Tunnel Engineering*, Charotar Publishing House.

L= Lecture, T= Tutorial, P= Practical, C= Credit

w.e.f. academic year 2019-20 and onwards

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- learn survey methods such as tacheometry, curve settings, hydrographic survey, photogrammetry, remote sensing, GPS and GIS technology
- use latest instruments like EDM, total station, GPS etc.
- employ appropriate survey methods in land survey, construction projects and to generate maps

**Syllabus:**

**Tacheometry:** Definition, principles, methods and self-reducing tacheometers.

**Curve Settings:** Basics, Elements & Geometry, Designation, Problems in Curve location, setting out of circular and transition curves, basics of vertical curves.

**Computation of Areas & Volumes:** Computation of area of regular & irregular boundary, Trapezoidal & Simpson's rule, Electronic planimeter, area of closed traverse, computation of volume for earthwork in cutting & filling, capacity of reservoirs.

**Geodetic Survey:** basic Concept, triangulation survey, line and angle measurement, precise levelling

**Hydrographic Survey:** Significance of hydrographic survey, Tide gauges, sounding, Locations, Locating stations using sextants.

**Engineering Survey:** route survey, use of leveling in profile and cross section, topographic survey, city survey map, underground survey methods during construction of engineering works.

**Modern Survey Instruments:** Digital theodolite, Electronic Distance Measurement, Total Station: Introduction, principle and uses

**Introduction to Photogrammetry & Aerial Surveys:** Photogrammetry, definitions, aerial photogrammetry, methods, Interpretation, mirror stereoscope, Measurement of distance on photographs, Parallax bars

**Modern Methods of Surveying:** Remote sensing: Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, visual and digital image processing and its applications. Global Positioning System: Definition, Principles of GPS and applications. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 11 experiments to be incorporated.

**References:**

1. Surveying & leveling Vol. I & II, B. C. Punmia
2. Surveying and Leveling, R. Subramanian
3. Advanced Surveying, A. M. Chandra
4. Surveying with Construction Applications, Barry Kawanagh
5. Surveying Vol. I & II, S. K. Duggal

**CL406**

**Seminar**

**[0 0 1 1]**

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- discover problems of Civil Engineering and review relevant literature
- discuss & explain various dimensions of problem chosen
- identify, analyse and compile information in the form of a report and present

Student/s will be assigned one topic related to any field of civil engineering. He/ she will work under guidance of faculty and his / her progress will be monitored continuously. The seminar will be presented during the semester before the classmates and faculty.



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand material properties and design methodologies for Concrete and Steel structures
- analyse and design Reinforced Concrete elements like beam, slab, column, footing, staircase
- assessment of serviceability criteria Reinforced Concrete beam and slab
- analyse and design steel elements like tension member, compression member, beam, footing
- design different type of connections for steel elements

**Syllabus:**

**Design Philosophies:** Introduction: Types of structures and their elements, Material Characteristics, Loads, Design Methods – Elastic Method, Limit State Method and Plastic Method

**Reinforced Concrete:** Rectangular beam, Tee and Ell beam, Simply supported slab, Shear, bond and deflections of beam and slab, Axially loaded short Column, Isolated footing, Staircase

**Steel Structures:** Tension Member: single and built-up sections, Choice of sections

**Column:** single and built-up sections, choice of sections, lacing and battening, splices.

**Connections:** Riveted, bolted and welded joints, their strength and efficiency, eccentric loading

**Beam:** rolled sections, deflections, connections

**Foundation:** Slab base, Gusseted, Grillage

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 6 experiments to be incorporated.

**References:**

1. S. R. Karve and V. L. Shah, Limit State Theory and Design of Reinforced Concrete, Structures Publishers
2. H. J. Shah, Reinforced Concrete, Vol. I, Charotar Publishing House Pvt. Limited.
3. V. L. Shah and Veena Gore, Limit State Design of Steel Structures IS:800-2007, Structures Publication
4. M. R. Shiyekar, Limit State Design in Structural Steel, PHI Learning
5. IS CODES: IS 456, IS 800, IS 875, SP 16, SP 34, SP 6(1)

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- comprehend the hydrological cycle and various hydraulic structures
- compute the rainfall and runoff characteristics
- evaluate water requirement for various types of crop
- analyze various types of ground and surface water problems
- analyze the factors affecting the design of gravity and earth dam.

**Syllabus:**

**Hydrology:** Hydrologic cycle, factors affecting and estimation of rainfall, runoff, hydrograph analysis, Unit and S-curve hydrograph.

**Ground Water:** Sources, types of well, well irrigation, hydraulics and capacity of well. Aquifer, aquifuge, specific retention, specific yield.

**Water Requirements of Crops:** Functions of irrigation water, types of soil and water availability, assessment of quantity of irrigation water, depth and frequency of irrigation, duty, delta and factors affecting, consumptive use of water, crop rotation.

**Irrigation:** Necessity, benefits and ill effects. Methods: Uncontrolled flooding, free flooding, border strip method, contour farming, sprinkler and drip irrigation. Water Logging: effects, causes and remedial measures.

**Flow Irrigation:** Canals, introduction to silt theories, meandering of river, river training works, Cross drainage works, groynes, marginal bunds, levees, weir, canal fall and distribution systems.

**Dams:** Earth Dams: Types, causes of failures, forces acting including earthquake, seepage and stability analysis, slope protection. Gravity Dams: Forces acting including earthquake, stability analysis, elementary profile, practical profile, high and low dams. Introduction to check dams.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. S. K. Garg, Irrigation and hydraulic structures, Khanna Publishers
2. B. C. Punamia, Irrigation and water power engineering, Laxmi Publications
3. P. N. Modi, Irrigation water resources and water power engineering, Standard book house.
4. Ralph A. Wurbs and Wesley P. James, Water resources engineering, Prentice Hall
5. P Jaya Rami Reddy, A textbook of hydrology, Laxmi Publications

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- estimate the environmental pollution from available statistics
- assess the quality of water and wastewater
- analyze and design water treatment and distribution systems
- analyze and design sewerage system and appropriate wastewater treatment method

**Syllabus:**

**Water Pollution:** Development and environmental pollution, ground water resources recharge and protection.

**Water Treatment:** Water quality parameters, natural purification process. Design of Screening, Aeration, Sedimentation, Clariflocculation, Filtration and Disinfection.

**Water Distribution system:** Gravity and pressure flow, pumping systems, capacity of reservoir; types and methods of water supply.

**Wastewater:** Sources, Classification, Characteristics and quality assessment.

**Wastewater Conveyance:** Objectives of Sanitation, quantity and quality of domestic sewage, sewerage systems and design.

**Wastewater Treatment:** Objectives, Classification and stages. Unit operations and types of wastewater treatment. Biological treatment processes: Activated Sludge Process and Design.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 11 experiments to be incorporated.

**References:**

1. G. S. Birdie and J. S. Birdie, Water supply and sanitary engineering; Dhanpat Rai Publishing
2. Santosh Kumar Garg, Water Supply Engineering (Environmental Engineering-Vol. I); Khanna Publishers
3. Santosh Kumar Garg, Sewage Disposal and Air Pollution Engineering (Environmental Engineering-Vol. II); Khanna Publishers
4. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering; McGraw-Hill International Editions-Civil Engineering Series
5. Mark J. Hammer, Mark J. Hammer Jr., Water and Wastewater Technology; Prentice-Hall of India

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- comprehend basic concepts and components of railways, bridges, docks and harbour
- design the railway track geometry
- select appropriate points, crossing and signalling facilities
- select and recommend appropriate site and section of bridge

**Syllabus:****Railway Engineering**

**Introduction:** History, Indian railways, recent developments, different gauges, requirements of an ideal alignment

**Track and Track stresses:** Requirements of a good track, forces acting on track, coning of wheels, tractive resistance and hauling capacity.

**Railway components:** rails, sleepers, ballast, types of sleepers and ballast.

**Geometric design of Track:** gradients, grade compensation on curves, circular curves, super elevation, safe speed on curves, transition curves, compound curves, extra clearance and widening of gauge on curves, vertical curves.

**Points and Crossings:** Necessity, turnouts, switches and its components, head block, types of crossings, and types of track junctions.

**Signalling and Interlocking:** Objectives of signaling, classification of signals, systems for controlling train movement, interlocking, modern signaling installations.

**Recent Advances in Railways:** Metro Rail, Light Rail, Mono Rail, High Speed Rail

**Bridge Engineering**

**Introduction:** History, components, classification, types, requirements. Culverts and causeway: Layout plan, advantages and disadvantages, site suitability and selection criteria.

**General Principles of Design:** Maximum discharge, velocity measurement, water-way, free board, afflux, clearance, economic span, width of carriage way, bridge loading.

**Docks and Harbour Engineering:** General, classification, requirements, planning and different components of port

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. Rangwala, Bridge Engineering, Charotar Publishing House
2. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai and Sons
3. Rangwala, Airport Engineering, Charotar Publishing House
4. S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai and Sons
5. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press
6. R.Srinivasan, Harbour, Dock and Tunnel Engineering, Charotar Publishing House

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- analyze and select appropriate plants and equipments to optimize the output
- select and implement appropriate temporary structures
- identify, analyze and implement deep and heavy foundations
- select and apply technically sound building services

**Syllabus:**

**Tools, Plants and Equipment:** Engineering fundamentals, types and classification, selection criteria. Earth handling and hauling machineries, hoisting, material handling etc.

**Temporary Structures:** Formwork: requirements, elements, joints, shuttering and de-shuttering, shoring, strutting and scaffolding, underpinning.

**Deep and Heavy Foundations:** Types of deep foundation like pile, well and caisson. Construction of cast in situ and pre-cast pile. Foundation for heavy equipment, strengthening of foundation.

**Grouting and Shotcrete techniques:** Concepts, methods and applications.

**Building Services:** Various services in modern buildings like Plumbing, solid waste disposal, thermal control, electrification, vertical transportation, fire control.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**References:**

1. W. B. McKay - Vol. I to IV, Building construction and Technology, Longmans, Green and Co
2. M. K. Hurd, Form work for concrete, Detroit American Concrete Institute
3. Subhash Patil, Plumbing engineering, Seema Publications
4. R. L. Peurifoy, Construction Planning Equipment and Methods, Tata Mcgraw Hill
5. Chudley and Greeno, Construction Technology, Prentice Hall
6. Roger Greeno, R. Chudley, Mike Hurst, Simon Topliss, Advanced Construction Technology, Pearson

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- investigate various types of soils through exploration methods and to compute bearing capacity
- identify, assess, recommend and design deep and shallow foundation
- calculate factor of safety for stability of slope and ground improvement techniques

**Syllabus:**

**Soil Investigations:** Methods of exploration, disturbed and undisturbed samples, penetration tests, plate load test.

**Types of Foundation:** Types, selection and design

**Bearing Capacity of Foundation:** Bearing capacity based on shear and settlement criteria, penetration tests, factors affecting bearing capacity

**Consolidation of soils:** one-dimensional theory, settlement analysis and evaluation.

**Settlement of Foundation:** Causes, settlement on various strata, factors affecting, control

**Earth Pressure and Retaining Structures:** types of earth pressure and theories, submerged soil, level and inclined backfill, pressure calculations for retaining walls, design of sheet piling.

**Stability of Slopes:** cohesive and non-cohesive soils and analysis, factor of safety

**Ground Improvement Techniques:** Drainage, dewatering, grouting, compaction, stabilization of soils, use of Geosynthetics, vibroflotation, reinforced earth structure, rock anchors etc.

Introduction to Machine foundation and advances in Geotechnical engineering

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**References:**

1. K R Arora, Soil Mechanics and Foundation Engg, Standard Publication
2. Shamsheer Prakash and Bharat Singh, A text book of soil mechanics, Nem Chand Publication
3. Braja M Das, Principles of Foundation Engineering, C.B.S Publishers
4. V.N.S Murthy, Advanced Foundation Engineering, Global Engineering
5. Donald P. Coduto, Foundation design; principles and practices, Pearson Publication

**Course Learning Outcome:**

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- **communicate and report effectively project related activities and findings**

**Syllabus:**

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

**Course Learning Outcome:**

By the end of this course students will be able to:

- Understand the importance of R directed thinking complementing L directed thinking
- Infer and discover processes and methods of creative problem solving
- Enhance and correlate their creative and innovative thinking skills
- Understand various disruptive innovations and techniques
- Analyze and apply various tools of creativity to some basic problems

**Syllabus:****1. INTRODUCTION:**

- Introduction to Creativity and Innovation
- Creativity V/s. Innovation
- Creativity as thinking skill
- Critical Thinking V/s. Creative Thinking
- Lateral Thinking
- Engineering and Creativity
- Creativity in Problem Solving

**2. TOOLS FOR CREATIVITY:**

- Brain storming
- Mind mapping
- SWOC Analysis
- Fishbone diagram
- Six thinking hats
- Borrowing brilliance
- Da Vinci's seven principles
- Provocation and movement
- Examples and case studies

**3. WHOLE NEW BRAIN**

- L directed thinking V/s. R directed thinking
- From agriculture age to Industrial age to Information age to Conceptual Age
- Need to high touch – design, story symphony, empathy, play, meaning

**4. SKILLS FOR DISRUPTIVE INNOVATORS**

- Introduction
- Associating
- Questioning
- Observing
- Networking
- Experimenting
- Putting skills into practice
- Case studies

**5. MEDICI EFFECT**

- Introduction
- Intersection
- Creating medici effect
- Making intersectional ideas happen
- Case studies

**6. TRIZ INNOVATION**

- Introduction
- Ideality



- Resources
- Contradictions
- Pattern of innovation
- Case studies

## 7. BIO MIMICRY

- Introduction
- Design of various products inspired by nature like Green building, bullet train, Nike Clothing, Velcro, Adhesive Tape, Turbine, self-heating plastic, friction reducing swimming suit, automated robot, screen display, deep blue

## 8. JUGAAD INNOVATION:

- Introduction
- Jugaad tactics: **Seek Opportunities in Adversity**, Do more with less, **Think and act Flexibly**, Keep it simple, Include the margin, Follow your heart.
- Case studies

## 9. CASE STUDY BY IDEO DESIGN THINKING MODEL

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

### References:

1. Daniel H. Pink, A whole new mind, Pearson publication, New Delhi
2. Benyus, J.M.1997. Biomimicry:Innovation Inspired by Nature, HarperCollins,New York
3. Technical Innovation Center Inc, USA Altshuller G (1997) 40 Principles. TRIZ Keys to Technical Innovation. Technical Innovation Center Inc, USA Andrews P
4. Kelly, Tom (2001): The Art of Innovation, Lessons in Creativity from IDEO, America's Leading Design Firm, Doubleday, NY
5. Tina Seelig, Ingenius, A Crash course on Creativity Hayhouse, U.K
6. Edward de Bono, Lateral Thinking, Be more creative and productive, Penguin India
7. Edward de Bono, Teach Yourself to Think, Penguin India
8. Edward de Bono, Six Thinking Hats, Little Brown and Company
9. Jonah Lehrer, Imagine, How creativity works, Canongate, Edinburgh, London
10. John Adair, The Art of Creative Thinking, Kogan Page India, New Delhi
11. Jeff Dyer, Hall Gregersen & Clayton M. Christensen, The Innovator's DNA, Harvard Business Publishing
12. Daniel Goleman, Emotional Intelligence, Bloomsbury Publishing India P.Ltd.]
13. Howard Gardner, Five Minds for the Future, Harvard Business Review Press
14. Malcolm Gladwell, Blink: The Power of Thinking Without Thinking, Hachette Book Group USA
15. Navi Radjou, Jaideep Prabhu, Simone Ahuja, Jugaad Innovation, Wiley Publisher

### Website References:

1. Ideo.com
2. Asknature.org
3. Edwdebono.com
4. Triz40.com

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- assess types of loads and prepare layout for reinforced concrete structures
- analyse and design various structural elements of reinforced concrete building
- analyse and design reinforced concrete structures like Retaining Wall, Water Tank, Portal Frame, Slab Type Bridge
- demonstrate earthquake resistant design features for various structures

**Syllabus:**

**Reinforced Concrete Building :** Assessment of loads like gravity, wind and earthquake, distribution of loads, structural layout, continuous slabs, continuous beam, Slender column with uniaxial and/or biaxial bending, combined footing, flat slab, ribbed floor, structural detailing, beam subjected to Torsion

**Other types of Reinforced Concrete Structures :** Retaining Wall, Water Tank, Portal Frame, Platform Shed, Slab Type Bridge, structural detailing

**Earthquake Resistant Design and Detailing****Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

**References:**

1. S. R. Karve and V. L. Shah, Illustrated Design of Reinforced Concrete Buildings, Structures Publishers
2. N. Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers
3. S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill
4. H. J. Shah, Reinforced Concrete, Vol I and II, Charotar Publishing House
5. IS CODES IS: 456, 875, 3370, 1893, 4326, 13920, SP 16, SP 34

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- identify, analyse and quantify air pollution, effects and design appropriate air pollution control equipment
- comprehend, analyse and formulate solid waste management strategies
- assess noise pollution, adverse effects and apply corrective noise pollution control methods
- know the values of legal provisions for environmental beneficiaries

**Syllabus:**

**Air Pollution:** Sources, classification, characteristics, effects, dispersion patterns and behaviour of air pollutants. Emission quantification, limiting concentrations and standards. Air pollution control systems: Classification and types, Source correction methods. Particulate emission control-Gravitational settling chamber, Cyclone separator, Fabric filter, Electrostatic precipitator, Wet scrubbers. Gaseous emission control-Absorption by liquids and solids.

**Solid Waste Management:** Sources, classification, composition and characteristics of solid wastes. Elements of solid waste management as collection, transportation, processing for recovery and final disposal. E-waste management and recycle.

**Noise Pollution:** Structure and measurement of noise. Sources, effects and control of noise pollution, limiting concentrations and standards.

**Environmental Legislation:** Regulatory authorities and important Environmental Acts in India.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 8 experiments to be incorporated.

**References:**

1. M. N. Rao and H. V. N. Rao, Air Pollution; Tata McGraw-Hill Publishing Company
2. G. S. Birdie and J. S. Birdie, Water supply and sanitary engineering; Dhanpat Rai Publishing Company
3. Santosh Kumar Garg, Sewage Disposal and Air Pollution Engineering (Environmental Engineering-Vol. II); Khanna Publishers
4. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering; McGraw-Hill International Editions-Civil Engineering Series
5. Arcadio P. Sincero and Gregoria A. Sincero, Environmental Engineering; Prentice-Hall of India

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- Comprehend basic requirements of highway and airport
- plan and design highway geometrics
- select appropriate pavement material and design road pavement
- select appropriate technology for road construction
- Assess various parameters of traffic

**Syllabus:****Highway Engineering**

**Introduction:** Importance, different mode of transportation and its scope, characteristics of road transport, scope of highway engineering.

**Highway Development and Planning:** Historical development of road construction, highway development in India, necessity of highway planning, classification of roads, planning surveys and interpretation

**Highway Alignment and Surveys:** Road alignment, principles and factors governing the alignment, road alignment surveys, documents to be prepared for a road project

**Highway Geometrics:** Introduction, cross section elements, sight distance, horizontal alignment, vertical alignment.

**Pavement Materials and Characterization:** Types, physical and engineering properties, basic tests on materials.

**Pavement Design and Construction:** Introduction, design factor, design of flexible pavement, design of rigid pavement, methods of road construction.

**Highway Maintenance:** Pavement failures, maintenance of highways, pavement evaluation, strengthening of existing pavements.

**Highway Drainage:** Importance of highway drainage, surface and subsurface drainage, erosion control.

**Hill Roads:** General considerations, alignment, geometrics of hill roads.

**Road Side Development:** Roadside development and arboriculture, planning plantation of trees, species and their selection.

**Highway Economics and Finance:** Highway user benefits, highway costs, economic analysis, highway finance.

**Traffic Engineering:** Introduction, Traffic Survey, Traffic Characteristics, Traffic operations, design of intersection, design of parking facilities, Highway lighting and sign, traffic planning and administrations.

**Airport Engineering:** General, history of aviation, organizations, airport classification, planning and different components

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**References:**

1. S.K. Khanna and Dr. C.E. G. Justo, Highway Engineering, Nem Chand and Bros.
2. S.P. Bindra, A course in Highway Engineering, Dhanpat Rai Publications
3. L.R. Kadiyali, Highway Engineering , Khanna Publishers
4. L.R. Kadiyali, Traffic Engineering and Transport Planning, Khanna Publishers
5. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning and Design, Nem Chand and Bros.
6. IRC: 37, 58, 67

**Course Learning Outcome:**

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- communicate and report effectively project related activities and findings

**Syllabus:**

Mini project may be carried out in one or more form of following:

product preparations, working/non-working models, prototype development, fabrication of set-ups, laboratory experiment development, process modification/development, simulation, software development, integration of software and hardware, statistical data analysis, survey, creating awareness in society.

The student is required to submit a report based on the work. The evaluation of the project shall be on continuous basis.

## Course Learning Outcome

By the end of the course, students will be able to

- Understand the Indian Legal System and Basics of different laws.
- Understand, explore, and acquire practical insight of legal system and its application in engineering profession.

## Syllabus

### Unit I

Introduction to Indian Legal System: Constitution of India, Sources of Law and Judicial system

### Unit II

1. Contracts and its Elements: Employment contracts, Contract Interpretation, Service Contract, Contract of Indemnity, Law of Agency  
2. Employment agreement

### UNIT 3

1. Legal Documentation: Drafting of legal documents including Non-Disclosure Agreements (NDA), Request for Proposal (RFP), collaboration agreements, joint venture agreements, tendering and sub-contracting

### UNIT 4

1. Intellectual Property Rights (IPR): Overview  
2. Trademarks, Copy Rights, Patents with special emphasis in Biotechnology Inventions, software, circuits and design  
3. Protection in Foreign Countries

### UNIT 5

1. Cyber Laws, E-Commerce and E-Governance

### UNIT 6 Introduction to Labour Laws

1. Labour Laws: Provident Fund, ESIC, Gratuity, Bonus, Perquisites, Contract labour  
2. Health, Safety and welfare of construction workers.

### UNIT 7

Taxation: Income Tax, Service Tax, VAT, Excise Duty

### UNIT 8

Alternate Dispute Resolution (ADR) in Domestic and International dealings

### UNIT 9

Introduction to Criminal Law  
RTI Act

## References

1. Karnika Seth, Computer Internet and New Technology Laws, Lexisnexis, First Edition 2013.
2. Prafulla C Pant, The Arbitration And Conciliation Act, 1996, Butterworths India, New Delhi.
3. Joseph Minattur, Indian Legal System, Indian Law Institute, New Delhi.
4. J. Beatson, Anson's Law Of Contract, Oxford University Press.
5. V. S. Datey , Indirect Taxes: Law And Practice, Taxmann Publications (P) Ltd, Latest Edition
6. Dr. Vinod K. Singhania And Dr. Monica Singhania , Student's Guide To Income Tax, Taxmann Publications (P) Ltd, Latest Edition.
7. S.C. Srivastava, Industrial Relations And Labour Laws, Vikas Publishing House Pvt. Ltd.



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- identify, analyze and implement suitable planning and management techniques
- create network, calculate project duration and optimize the time and minimize the cost
- implement resource allocation and control techniques
- plan and implement quality and safety management

**Syllabus:**

**Construction as Industry:** Introduction to construction industries, concepts and need of management in construction.

**Principles of Management:** concept, scope, functions of management.

**Construction Project Planning:** life cycle, identification, preparation, appraisal, detailed planning, implementation, monitoring and control.

**Network:** need, importance, Bar chart, CPM & PERT techniques, analysis of network, time-cost trade off, scheduling technique, updating project, resource allocation and levelling.

**Material Management:** Scope, importance, objectives, functions of material management classification and codification of material, inventory control: need, function, economic order quantity.

**Construction Equipment Management:** types of equipment and factors affecting selection, Functions of equipment management, owning and operating costs, Time-value of money concept, Economic life, safety, maintenance and repair of equipment.

**Labour Laws:** Labour laws for construction projects, welfare measures for labours.

**Quality Management in Construction:** Important aspects of quality control, methods, quality control manuals, ISO 9000 and other registrations.

**Organisational Structure and Construction Site Management:** construction organisations, types, principle, site management, functions of various personnel at site, services required at site.

**Safety management:** importance, rule, safety measures for construction activities.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. Chitkara, Construction Project Management, Tata McGraw Hill
2. Gahlot & Dhir, Construction Planning and Management, New Age International
3. Kumar Niraj Jha, Construction and Project Management, Pearson
4. Peurifoy, Construction Planning, Equipment and Methods, McGraw Hill
5. Punmia B C, Project Planning and Control PERT and CPM, Laxmi Publication

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- apply knowledge of tendering and contracting in civil engineering practices
- frame the specifications of material and workmanship for construction projects
- understand various legal aspects of construction projects
- estimate the quantity and compute the probable cost of various structures
- apply estimation and valuation techniques to solve engineering problems

**Syllabus:**

**Tendering:** types, pre-qualification of contractors, preparation, opening, mode of submission, scrutiny, rejection, contract document.

**Contracts:** Types, validity, forms, termination, earnest money and security deposit, general & special conditions of Contract, liquidated damages, contract disputes & settlements.

**Arbitration:** Meaning, purpose, types, power & scope, process.

**Specification:** objectives, importance, types, specification for material and workmanship, design and principles.

**Estimation of Quantity:** need, identifying the items of work, units of measurements and quantity, methods, general rules for measurements & quantity.

**Rate Analysis:** purpose, factors, methods, schedules of rate.

**Valuation:** Concept of cost, price, value, purpose, different forms of value, free and lease hold property, methods, tables. Depreciation methods. Rent: object, meaning and forms, methods.

Easement: definition, characteristics, extinguishments, effect on valuation, mortgage of property.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 6 projects to be incorporated.

**References:**

1. B. N. Dutta, Estimating & costing in Civil Engineering, UBS Publishers
2. R. H. Nanavati, Theory and practice of real valuation, Lakhani Book Depot
3. B. S. Patil, Civil Engineering Contracts, University Press
4. Rangwala, Valuation of real property, Charotar Book Publishing
5. M. Chakraborti, Estimating, Costing, Specification and Valuation in Civil Engineering

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- analyse and design industrial steel structures including connections
- analyse and design steel plate girder and footover bridge
- apply plastic method for analysis of beams
- design elements of masonry structures

**Syllabus:**

**Connection:** stiffened and unstiffened, moment and shear resisting structural connection.

**Industrial Steel Structure:** Types of trusses and their selection, effect of wind and earthquake loads and structural detailing, beam-column, gantry girder, Pre-engineered structures

**Other types of Steel Structure:** Plate Girder, Footover Bridge.

**Plastic Method:** Elementary plastic theory of bending, moment curvature relationship, plastic hinges, plastic moment of resistance, shape factor, load factor, plastic analysis of continuous beam.

**Masonry Structure:** Design of brick walls, effective thickness, wall under concentrated, uniformly distributed loads.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. V.L. Shah and Veena Gore, Limit State Design of Steel Structures IS:800-2007, Structures
2. M. R. Shiyekar, Limit State Design in Structural Steel, PHI Learning
3. S. S. Bhavikatti, Design of Steel Structures by Limit State Methods as Per IS 800-2007, I K International Publishing House
4. K.S. Jagadish, Structural Masonry, I K International Publishing House
5. IS Codes: IS 800, IS 875, IS 1905, SP 20

**CL704**

**Minor Project**

**[0 0 4 2]**

**Course Learning Outcome:**

After successful completion of the course, students will be able to

- practice acquired knowledge within the chosen area of technology for project development
- identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach
- reproduce, improve and refine technical aspects for engineering projects
- work as an individual or in a team in development of technical projects
- report project related activities effectively to peers and mentors

**Syllabus:**

The student(s) shall carry out project based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit project report based on the work.

**Course Learning Outcomes (CLO):**

After studying the course the students will be able to:

1. Analyze and evaluate performance behavior at individual, group and organizational levels.
2. Develop the ability to lead and motivate others to succeed.
3. Develop critical analytical skills that will help them diagnose situations pertaining to human behavior and generate effective solutions for the same.
4. Understand and apply principles of organizational dynamics relating to systems, culture, structure and change processes

**Syllabus****I. Introduction to Organizational Behaviour**

- **Concept of Organizational Behaviour (OB)**
- History , Nature and scope of OB
- Key elements in OB
- Inter-disciplinary contribution to OB
- **Managerial Roles**

**II. Individual Behaviour, Values & Personality**

- Concept of Individual Differences
- Values commonly studied across culture
- **Fundamentals and Determinants of Personality**
- Big Five Dimensions
- **Personality Traits**

**III. Learning & Perception**

- Fundamentals of Learning
- Learning Theories - Classical Conditioning Theory, Operant Conditioning Theory, Social Learning Theory
- **Behavior Modification**
- **Definition of Perception, Perceptual Process, Common Perceptual Errors**

**IV. Motivation**

- **Basic concept of Motivation**
- **Theories of Motivation** – Maslow, Herzberg's Two Factor Theory, ERG, McClelland , Equity and Vroom's Expectancy Theory

**V. Leadership**

- Introduction
- **Leadership Theories** - Trait Theories, Behavioral Theories and Situational Theories

**VI. Group Dynamics**

- Defining and classifying groups
- Stages of group development
- **Group Properties** – Roles, Norms, Status, Size and Cohesiveness
- **Group Decision making**

**VII. Managing Change in Organization**

- Definition, Forces of Change,
- **Causes for Resistance to Change, Overcoming Resistance to change**
- Lewin's Change Model

**VIII Organizational Culture**

- Meaning, Strong Culture vs. Weak Culture

- Creating & sustaining Culture
- Socialization

#### **IX. Conflict, Power & Politics**

- Nature & types of conflict, Causes and outcome of conflict
- Responses to conflict
- Bases of Individual Power
- Organizational Politics

Self-study content will be declared at the commencement of the course. Approximately 10% of the assessment will be upon this content.

#### **References:**

1. Robbins, S.P. Judge, T.A. & Sanghi, Seema. (2010). *Organizational Behavior*, Pearson.
2. Pareek, U. (2011). *Understanding Organizational Behavior*, Oxford University Press.
3. Luthans, F. (2006). *Organizational Behaviour*, Tata McGraw Hill.
4. Sekaran, U. (1989). *Organizational Behaviour: Text and Cases*, Tata McGraw Hill
5. Kreitner, R. & Kinicki, A. (2012). *Organizational Behavior*, McGrawHill/Irwin
6. Davis, K. & Newstrom, J.W. (1989). *Organizational Behaviour*, Tata McGraw Hill
7. Slocum, J.W. & Hellreigal, D. (2010). *Fundamentals of Organizational Behaviour*, Cengage Learning.

## **2CL404 CIVIL ENGINEERING PROJECT**

**[- - 4 4]**

The project will be of multifaceted nature based on fundamental knowledge of various civil engineering areas like structural analysis and design, computer applications, construction methods, materials, environmental engineering, water resources, foundation engineering, transportation engineering, town planning, remote sensing & GIS application. The student will design a project of specific field of civil engineering in all respect i.e. planning, layout, structural analysis, design, bill of quantity, estimate and detailed drawings for the same.

Student will work for 4 weeks intensively in summer followed by work during regular semester. Student is required to submit the project report at the end of civil engineering project

**Course Learning Outcome:**

After successful completion of the course, students will be able to

- use various tools and techniques to study existing systems
- critically analyse existing systems, thereby select and justify parameters to be improved
- start and manipulate proposed engineering solution as per industry / research / societal need
- achieve precision in uses of the tools related to their experiments/fabrication
- reorganize and refine various components of technology to optimize the resources at large
- appraise the potential of technology for scalability and wide spectrum of applications
- report project related activities effectively to peers, mentors and society
- follow and value health, safety and ethical practices during project

**Syllabus:**

The major project shall be based on the recent trends in technology, system/process analysis, construction/fabrication/production techniques, design methodologies etc. The student(s) shall carry out a comprehensive project at relevant Academic/R&D/Industrial organisation based on one or more of the following aspects: prototype design, product preparations, working models, fabrication of set-ups, laboratory experiments, process modification/development, simulation, software development, integration of software and hardware, data analysis, survey etc.

The student is required to submit comprehensive project report based on the work.



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- derive stiffness matrix and load vectors for various planar structural elements
- analyse two dimensional structures like beam, truss, frame and grid
- apply finite element method for one dimensional problems
- develop spread sheets and computer programs for two dimensional structures

**Syllabus:**

**Direct Stiffness method:** Stiffness matrix and load vector derivation for various structures like beam, truss, frame and grid, rotation transformation of axis, secondary effects like temperature change, support settlement etc.

**Finite Element Method:** Fundamentals, applications, basic formulation, derivation of element properties for one dimensional bar and beam element

Development of computer programme for two dimensional structures using stiffness method

Introduction of dynamic and nonlinear analysis

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

**References:**

1. J. M. Gere and W. Weaver, Matrix Analysis of framed structures, CBS Publishers
2. T. R. Chadrapatla and A. D. Belegundu, Introduction of Finite Element Method, Prentice Hall of India
3. Y. M. Desai, A. H. Shah and T. I. Eldho, Finite Element Method, Pearson Education Asia

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- gain insights about disaster and understand Engineering challenges for Disaster Management
- apply tools & techniques for disaster risk assessment of Infrastructure, preparing disaster management plan and Damage Assessment
- comprehend role of Civil Engineer in DRM and Climate Change Adaptation

**Introduction to Disaster Management (DM):** Types of Disasters, Importance & Significance of DM, Climate Change and DM, DM Institutional Framework

**Risk Assessment:** Risk, Vulnerability, Damage Assessment, Risk Assessment, Disaster Risk Modelling; Emerging Risks due to Development, Climate Change Adaptation, etc.

**Disaster Management:** Phases, DM Institutional Framework, Incident Command System, Disaster Management Plan, Contingency Planning, Concept of Community Based Disaster Management, Community Health and Safety.

**Disaster Communication:** Early Warning and Disaster Monitoring, Disaster Communication, Role of GIS and Remote Sensing in Disaster Risk Management.

**Role of Civil Engineer in Disaster Management:** Tools, Techniques, Challenges and solutions for DM and Climate Change Adaptation, Do's and Don'ts before, during and after disasters.

**Disaster Management Programmes:** DM Programmes and Practices and Case Studies.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum five tutorials to be incorporated.

## Text books:

1. Modh Satish, Introduction to Disaster Management, Macmillan
2. Sinha Prabhas C., Disaster Relief: Rehabilitation and Emergency Humanitarian Assistance, SBS Publishers.
3. Wisner Ben, Blaikie Piers, Cannon, Terry & Davis, Ian, At risk natural hazards, people's vulnerability and disasters, Routledge.
4. Singh R.B. (Ed.), Natural Hazards and Disaster Management Vulnerability & Mitigation, Rawat Publications.
5. Blodgett Robert & Keller Edwards, Natural Hazards: Earth's processes as hazards disasters and catastrophe, Pearson Prentice Hall

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- compute stresses due to prestressing
- assess losses in prestress, short and long term deflection, flexural and shear strength of beam
- design pre-tensioned and post-tensioned beam

**Syllabus:**

Load balancing concept, losses in Prestress, short term and long term deflection of beams, Flexural and shear strength of beam

End block design and Determination of cable profile

Limit state analysis and design of members for bending, shear and torsion

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 10 tutorials to be incorporated.

**References:**

1. N. Krishna Raju, Prestressed Concrete, Tata McGraw-Hill
2. N. Rajagopalan, Prestressed Concrete, Narosa Punlication
3. T. Y. Lin, Design of Prestressed Concrete Structures, Wiley India Pvt. Ltd.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand, select and implement specialized construction techniques
- select and apply appropriate bridge construction techniques
- conceptualize and erect pre-cast and pre-fabricated structures
- select and construct appropriate underground and offshore structures

**Syllabus:**

**Specialized construction techniques:** Construction aspects and procedures of specialized construction techniques like box pushing, box type retaining walls, slip form for chimney and silo construction, sheet piling and diaphragm walls, well and caisson, underpinning, shotcreting and guniting, vacuum dewatering- finishing and curing methods.

**Underground Construction:** Site investigation and geological studies, drilling, pneumatic breakers, explosives, blasting. Tunnelling technology: mechanized, shield, micro, special methods; Hazards and safety.

**Offshore construction:** Equipments: Crane barges, derrick barges, drilling vessels; underwater construction; Stages of offshore structure, construction, facilities and methods of fabrication.

**Bridge construction and erection techniques:** types, bridge construction methods: in-situ and pre-cast construction methods, balanced cantilever methods, span-by-Span method, incremental launching method.

**Pre-cast and pre-fabrication construction:** Planning, analysis and design considerations for pre-cast and pre-fab constructions. Materials, moulds and modular co-ordination, standardization. Joints in pre-cast and pre-fab constructions, curing techniques. Industrial structures with skeletal and large panels. Handling, transportation and erection techniques. Pre-cast and pre-fabricating technology for low cost and mass housing schemes, case studies. Fabrication and erection of steel structural elements.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 4 tutorials to be incorporated.

**References:**

1. M. Levitt , Precast concrete - Materials, manufacture properties and usage, Applied Science Publications
2. Formwork for concrete, M. K. Hurd, Detroit [American Concrete Institute](#)
3. Chew Yit Lin, Michael, Construction Technology for Tall Buildings, Singapore University Press, World Scientific
4. Roy Chudley and Roger Greeno, Advanced construction techniques, Pearson
5. Beer, G., Technology innovation in underground construction. CRC Press
6. Richardson, J.G., Pre-cast concrete Production, Cement and Concrete Association
7. Gerwick, B., Construction of marine and offshore structures. CRC Press

**Course Learning Outcomes:**

After successful completion of the course, student will be able to

- identify, understand and apply concepts of sustainable development
- select and effectively apply sustainable green building materials and construction aspects
- conduct quantitative estimation and implement methodologies for resource conservation
- comprehend various provisions in the National and International Green Building Codes

**Syllabus:**

**Sustainable Development:** Concept, need and life cycle analysis for sustainability.

**Green Buildings:** Concepts, Meteorological and climatic considerations, Sustainable site selection and planning.

**Environmental friendly building materials and technologies:** Features and characteristics of natural materials like bamboo, timber, rammed earth, stabilized mud blocks, lime and lime-pozzolana cements, ferro-cement, agro and industrial wastes. Alternative technologies like filler slab, rat trap bond etc. for sustainable construction.

**Energy conservation and renewable energy:** Energy usage and conservation. Embodied energy of materials, energy efficient lighting, building automation, ventilation and air quality requirement passive cooling and thermal comfort. Renewable energy harvesting and usage in buildings.

**Water conservation and wastewater management:** Water usage minimization, planning and systems for water conservation. Decentralized wastewater treatment techniques.

**Solid Waste Management:** Introduction to vermi-composting of domestic solid waste management. Techniques and concepts for construction and demolition wastes utilization.

**Green Building Rating Systems:** Introduction to Leadership in Energy and Environment Design (LEED), Green Rating for Integrated Habitat Assessment (TERI-GRIHA).

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 5 tutorials to be incorporated.

**References:**

1. K. S. Jagadish, B. V. Venkatarama Reddy and K. S. Nanjunda Rao, Alternative building materials and technologies; New Age International
2. G. D. Rai, Non-conventional energy resources; Khanna Publishers
3. Standards and specification for cost effective Innovative materials and technologies; BMTPC, Govt. of India
4. Guidelines for reconstruction and new construction of houses in Kutchh earthquake affected areas of Gujarat; Gujarat State Disaster Management Authority (GSDMA)
5. ECBC (Energy Conservation Building Code); Bureau of Energy Efficiency, Ministry of Power, Govt. of India
6. GRIHA Manual; TERI-GRIHA



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- comprehend requirements of dock, harbour and airport
- **plan and design various components of dock, harbour and airport**
- select appropriate aids for operation of dock, harbour and airport

**Syllabus:**

**Harbour and Port:** Fundamentals of water transportation, classification, design and requirements, types, accessibility, size, shape, depth, considerations of natural phenomena like Tides, Wind and Wave.

**Break Waters:** types, alignment, forces acting, classification, design, failures.

**Docks:** introduction, types, Open berths, approaches and depth of docks and basins, location and internal arrangement, design and construction of basin or dock walls.

**Berthing Structures:** Jetties, piers, wharves, quays, dolphins, trestle, moles and fender.

**Navigational Aids:** Necessity, types, light-houses, beacon lights, lightships, buoys, moorings.

**Transit Sheds and Warehouses:** planning, design and specific requirements.

**Airport Engineering:** History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, airport classification, airport master plan, regional planning, airport site selection and surveys.

**Terminal Area and Airport Layout:** Terminal area, building requirements, vehicular circulation and parking area, apron, hanger, blast considerations.

**Airport Capacity and Configuration:** Capacities and criteria for runway, gate and taxiway.

**Design of Airport Elements:** Runway, intersection and taxiway design.

**Visual Aids and Air Traffic Control:** Airport: markings and lighting. Air traffic control.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. Oza and Oza , Docks and Harbour Engineering, Charotar Publishing House
2. R.Srinivasan, Harbour, Dock and Tunnel Engineering, Charotar Publishing House
3. S.P.Bindra, A course in Docks and Harbour Engineering, Dhanpat Rai Publications
4. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning and Design, Nem Chand and Bros.
5. G.V.Rao, Airport Engineering, Tata McGraw Hill Publishing

## CL661 Advanced Wastewater Treatments and Environmental Management [3 1 0 4]

### Course Learning Outcome:

After successful completion of the course, student will be able to

- analyze input parameters, select, configure and design appropriate tertiary wastewater treatment systems
- identify, select and design appropriate module of the membrane bioreactor process
- identify, select and evolve a framework of environmental management systems and tools for environmental benefits
- correlate economic development and environmental legislation with impacts on environment

### Syllabus:

**Pressure filtration:** Objectives, benefits, concept, systems, materials and media, design and operation and maintenance.

**Advanced biological processes for wastewater treatment:** Modifications of suspended growth (Activated sludge) biological process, extended aeration processes, oxidation ditch and design. Rotating biological contactors, sequential batch reactors.

**Membrane bioreactors (MBR):** Concept, membrane types and modules, operational problems, monitoring, advantages and disadvantages, pretreatment and design.

**Environmental dynamics and management:** Environmental Management System (EMS) – Meaning, advantages, beneficiaries and structure. EMS models/tools, certification procedures and renewal. Environmental simulation models.

**Developments and environmental issues:** Environmental quality and economic gain of developments, corporate social responsibility (CSR), environmental indices and indicators for assessment of environmental effects. Evaluation and implementation of environmentally sound alternatives – CDM, Carbon trading, refurbishment of electronic products.

**Environmental regulations:** Global and Indian perspective of environmental legislations. Indian constitution and environment, regulatory authorities in India and their scope and powers. Important environmental regulations in India.

### Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### Tutorial Work:

Tutorial work will be based on above syllabus with minimum 4 tutorials to be incorporated.

### References:

1. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering; McGraw-Hill International Editions-Civil Engineering Series
2. Metcalf and Eddy, G. Tchobanoglous, F. L. Burton, H. D. Stensel, Wastewater engineering treatment and reuse; Tata McGraw-Hill Publishing Company
3. Mark J. Hammer, Mark J. Hammer Jr., Water and Wastewater Technology; Prentice-Hall of India
4. N. K. Uberoi, Environmental Management; Excel Books
5. John Pallister, Environmental Management; Oxford University Press
6. Environmental Concerns and Sustainable Development: Some perspectives from India, Sakarma Somayaji, Ganesh Somayaji, TERI Press
7. J. Glynn Henry and Gary W. Heinke, Environmental Science and Engineering; Pearson Education Asia



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand principle and relevance of advanced technologies like Remote Sensing, Geodesy, GPS and GIS.
- select appropriate tools, technique and software for various applications
- analyse and suggest suitable solution to solve the problems

**Syllabus:**

**Remote sensing:** Types: optical and microwave remote sensing, limitations of methods, concept of signatures, sensors and satellites, electromagnetic radiation, spatial and spectral resolution, digital image format, visual image analysis, histogram, image enhancement, digital image classification, application of remote sensing for geological and soil mapping, water resources, environmental assessment, construction, water resource management.

**Geodesy:** concept of geodetic survey, adjustment, geodetic reference system, concept of terrestrial reference system, types of datum, datum transformation, coordinate system, concept of mapping system, map projection system (UTM, Transverse, Lambert).

**GPS - satellite surveying:** Navigational satellite systems: GPS, GLONASS, GALILEO, COMPASS, IRNNS etc. GPS signals and pseudo range and carrier phase observable, GPS data collection, errors and bias, corrections of errors, GPS survey types, data processing, applications in civil engineering field.

**GIS:** GIS and geography, spatial mapping, components. Data: collection, analyse, storage, retrieval, modelling. Data format: raster and vector. Digitization of maps, data input and storage, output. GIS based analysis: geo-referencing and map registration, converting geo-references, creating data sets by manual input, database system and management, visualization of continuous surfaces, scale and level of geographical details, digital terrain modelling, interpolation of surfaces, DEM, deriving surface topology and drainage network, GIS software, spatial analysis, applications of GIS in civil engineering

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. Kang-Tsung Chang, Introduction to Geographic Information Systems, McGraw-Hill.
2. Lillesand, Kiefer, Remote sensing and image interpretation, John Wiley & Sons.
3. Ahmad El Rabbany, Introduction to Global Positioning System, Artech house.
4. Bhatt, Global Navigational Satellite System, BS Publication.
5. Basudeb Bhatt, Remote Sensing and GIS, Oxford University Press.
6. M. Anji Reddy, Remote Sensing and Geographical Information System, B S Publication.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand phenomenon, causes and effects of earthquake
- apply concepts of dynamics to earthquake problems
- design earthquake resistant RCC structures using codal provisions
- design earthquake resistant masonry structures

**Syllabus:**

**Seismology:** Causes of earthquakes and seismic waves, magnitude, intensity and energy release, plate tectonics, types of earthquakes, related IS codes.

**Characterization of Ground Motion:** Measurement of earthquake ground motion, seismic instruments, strong ground motion parameters.

**Effect of Damping:** Types of damping and their form, Logarithmic Decrement.

**Forced vibration of Single Degree of Freedom System:** equation of motion, harmonic force excitation, Dynamic Magnification Factor, Resonance, system excited at base, Transmissibility of force/motion.

Free vibration of Multi-Degree of Freedom System.

Earthquake resistant design of buildings, Ductile Detailing.

Earthquake resistant design for masonry structures.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India
2. A. K. Chopra, Dynamics of Structures, Pearson Education Asia Pte.
3. S. L. Kramer, Geotechnical Earthquake Engineering, Pearson Education Asia Pte.
4. S. K. Duggal, Earthquake Resistant Design of Structures, OXFORD University Press
5. IS CODES: IS:456, IS:1893, IS:4326, IS:18935, IS:13920

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- estimate properties of reinforced earth and geosynthetics
- analyze and design reinforced earth wall
- design geosynthetics for pavement construction
- devise environmental conservation techniques using geosynthetics

**Syllabus:**

**Introduction:** Definition, advantages, limitations and applications of reinforced earth and geosynthetics.

**Earth Reinforcing Materials:** characteristics of reinforcing materials, testing of earth reinforcing material, soil reinforcement interaction.

**Reinforced Earth:** analysis of randomly reinforced earth, analysis and design of reinforced earth wall.

**Testing of Geosynthetics:** Experimental evaluation of properties of geosynthetics depending on its functions.

**Applications of Geosynthetics in Practice**

**Pavements:** Geosynthetics for separation, drainage and filtration, overlay, design and construction in roads and railway tracks as per AASHTO and other relevant guidelines.

**Environmental Control:** Liners for pond and canal, landfill, occurrences and mitigation methods for landslide, causes and control techniques of soil erosion.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 5 tutorials to be incorporated.

**References:**

1. Koerner R. M, Designing with Geosynthetics, Prentice Hall
2. Holtz, R. D. Christopher, B. R & Berg, Geosynthetic Engineering, Bitech Publishers
3. Swami Saran, Reinforced Soil and its Engineering Application, I. K. International
4. G Venkatappa Rao, P. K. Banerjee, J. T. Shahu, G. V. Ramana, Geosynthetics: New Horizons, Asian Books
5. Mandal J. N., Reinforced Soil and Geosynthetics, Oxford IBH and Publications

## CL723 Maintenance and Rehabilitation of Structures [3 1 0 4]

### Course Learning Outcome:

After successful completion of the course, student will be able to

- comprehend aspects related to maintenance of different structures
- demonstrate factors affecting durability and compatibility aspects of concrete
- illustrates different techniques for evaluating cause of distress in concrete
- apply different repair materials and techniques for strengthening & retrofitting of structures
- discover different construction failures through investigation

### Syllabus:

**Maintenance of Structures:** Building, Highway and Railway Bridge, Pavements.

**Durability & Compatibility of Concrete:** Microstructure of Concrete, Physical and Chemical causes of distress in concrete, Corrosion in Concrete, Cracks in Structures.

**Assessment of Distress:** Destructive, Semi-destructive & Non-destructive methods of testing such as Core test, Carbonation test, Rebound hammer, UPV test, Cover meter, Half-cell Potentiometer test, Resistivity meter test.

**Repair Material & Techniques:** Grouts, Epoxies, Polymers, Quick setting/hardening concrete & mortars, Grouting and Guniting, Underpinning.

**Strengthening and Retrofitting:** Strengthening and retrofitting of columns, beams, walls, footings for masonry and concrete structures, Evaluation of repaired structures.

**Design and Construction Failures:** Meaning, Causes, Prevention of failures, Investigation of failures, Forensic engineering.

### Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### Tutorial Work:

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

### References:

1. J. H. Bungey, S G. Millard and M. G. Grantham, Testing of Concrete in Structures, Taylor and Francis
2. P. K. Mehta and PJM Monteiro, Concrete Microstructure, Properties and Materials, Tata MacGraw Hill
3. Handbook on Repair and Rehabilitation of RCC Buildings CPWD, India
4. Peter Emmons and Gajanan Sabnis, Concrete: Repair and Maintenance Illustrated, Problem Analysis, Repair strategy and Techniques, Galgotia Publishers
5. Jacob Feld and Kenneth Harper, Construction Failure, John Wiley & Sons

**Course Learning Outcome:**

After successful completion of the course, students will be able to:

- perform traffic studies, analysis and design road network
- develop engineering solutions to ease traffic congestion in cities and improve road safety
- perform economic analysis of transportation projects

**Syllabus:**

**Traffic Engineering and Characteristics:** Importance and scope of traffic engineering, traffic characteristics, human factors governing road user characteristics, vehicular characteristics.

**Traffic Engineering Studies and Analysis:** traffic volume studies and analysis, speed studies and analysis, origin and destination studies and analysis, parking studies and analysis.

**Fundamental parameters and relations of traffic flow:** Traffic stream flow characteristics, Speed-Flow-Density relations, travel time, headway, spacing, time-space diagram, time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams; Passenger car units, Capacity and level of service.

**Traffic Regulation and Control:** Regulations and controls on driver, vehicle controls, flow regulations, parking regulations, general controls, enforcement of regulations, traffic signs and signal design, road markings, road intersections and design, design of rotary intersections, design of parking facilities, traffic control aids and street furniture.

**Traffic Safety and urban congestion:** Road accidents- Causes and prevention, accident analysis and investigation, planning and design of pedestrian facilities, street lighting, road safety issues, traffic management and traffic forecasting, traffic and the environment, nature of traffic problems in cities, public and intermediate transport, use of technology to improve transportation systems, intelligent transportation systems(ITS)

**Transport Economics:** Economic evaluation of transportation plans, Vehicle operating costs, value of travel time savings, traffic congestion, traffic restraints and road pricing.

**Self Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 4 tutorials to be incorporated.

**References:**

1. L. R Kadiyali, Traffic Engineering and Transport Planning, Khanna Publishers
2. S. K. Khanna, C.E.G Justo, A. Veeraragavan, Highway Engineering, Nem Chand and Brothers
3. C. Jotin khisty, B. Kent Lall, Transportation Engineering: an Introduction, PHI Learning, Eastern Economy
4. Mike Slinn, Peter Guest and Paul Matthews, Traffic Engineering Design, Elsevier

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- comprehend concept of infrastructure, infrastructure economics, policies and regulations
- identify and analyze issues related to infrastructure projects
- recommend appropriate infrastructure management plan

**Syllabus:**

**Introduction and Infrastructure scenario:** Types, role, need and scenario of infrastructure, infrastructure crisis.

**Urban Infrastructure:** Concept of urbanization and economic development, scenario of municipal infrastructure, models of urban governance, municipal finances, major municipal reforms, legislations pertaining to urban infrastructure.

**Rural Infrastructure:** Overview, concept of rural infrastructure planning, state of rural infrastructure, growth, rural characteristics, strategies to improve infrastructure in rural areas.

**Private Involvement in Infrastructure:** Overview, benefits, problems and challenges of infrastructure privatization.

**Infrastructure Economics and Finance:** Principles of finance, infrastructure economics, developing financial models for infrastructure, introduction to project finance.

**Infrastructure Risk Management:** Risks in infrastructure, quantitative risk analysis, qualitative risk management, risk management strategies.

**Infrastructure Maintenance:** Introduction, need and requirement and preventive techniques for maintenance, recycling techniques.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 4 tutorials to be incorporated.

**References:**

1. J. Parkin and D. Sharma, Infrastructure Planning, Thomas Telford
2. P. Chandra, Projects: Planning, Analysis, Selection, Financing, Implementation, and Review, Tata McGraw-Hill
3. S. Goodman and M. Hastak, Infrastructure Planning Handbook: Planning, Engineering, and Economics, McGraw-Hill
4. T. J. Webster, Managerial Economics: Theory and Practices, Elsevier
5. Willie Tan, Principles of Project and Infrastructure Finance, Taylor and Francis

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- characterize, identify, classify and estimate sources of hazardous wastes
- identify and apply hazardous waste reduction, treatment and disposal technique
- evolve hazardous waste management plans based on current situations, national and international legislations

**Syllabus:**

**Hazardous waste:** Definition, characterization, categories and engineering classification, sources, pathways of human exposure.

**Health Hazards:** Industrial health hazards, potential threat to human health, occupational health hazards, hazardous waste toxicity.

**Hazardous Waste Management:** Safe storage, transportation, treatment and disposal of industrial hazardous wastes, hazardous waste site remediation, reduction, reuse and recycling of hazardous wastes.

**Legal Aspects of Hazardous Wastes:** Guidelines and legal requirements for handling, safe storage & disposal, application for operating facility for hazardous wastes and chemicals.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Tutorial Work:**

Tutorial work will be based on above syllabus with minimum 6 tutorials to be incorporated.

**References:**

1. Subijoy Dutta, Environmental Treatment Technologies for Hazardous and Medical Wastes; Tata McGraw-Hill
2. Rajiv K. Sinha, Sunil Herat, Industrial and Hazardous Wastes; Pointer Publishers
3. Calvin R. Brunner, Hazardous Waste Incineration; McGraw-Hill International Editions-Industrial Plant Engineering Series
4. Michael D La grega, Jeffrey C Evans, Philip L Buckingham, Hazardous Waste Management; McGraw-Hill Publishing Company

## CL793 Hydraulic Structures [3 1 0 4]

### Course Learning Outcome:

After successful completion of the course, student will be able to

- describe and interpret knowledge related to different dams, outlet works and drop structures.
- analyze and design different types of dams, spillways and falls.
- relate and select different combination of hydraulic structures.

### Syllabus:

**Elements of dam engineering:** Introduction, site assessment and selection criteria for different types of dam, spillways and ancillary works.

**Embankment dam engineering:** Types and characteristics of embankments, properties and characteristics of soil, principles of design, determination of internal seepage, stability and stresses, control measures, settlement and deformation in rock fill embankments.

**Concrete dam engineering:** Concepts and criteria for loading, stability analysis, design, elementary dam profile, openings in dams.

**Dam outlet works:** Types of spillways and ancillary works, cavitation on spillway, features and design of spillways, energy dissipation, stilling basins, plunge pools.

**Drop structures:** Types of falls, design principles of falls, functions and types of regulators, types of aqua ducts and siphons.

**Maintenance, Repair and Retrofitting**

### Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### Tutorial Work:

Tutorial work will be based on above syllabus with minimum 4 tutorials to be incorporated.

### References:

1. P. N. Modi, Introduction to Water Resources And Waterpower Engineering, Standard Publication
2. G. L. Asawa, Irrigation and Water Resources Engineering, New Age International
3. S. K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers
4. Serge Leliensky, Design Textbooks in Civil Engineering Vol. 1 & 2: Irrigation Engineering: Canals and Barrages; Oxford and IBH Publishing House



**Course Learning Outcome (CLO):**

At the end of the course, students will be able to -

- understand the architecture of web based applications and underlying technologies
- design an efficient web based applications using appropriate web technologies
- develop web based application using appropriate scripting languages

**Syllabus:****Teaching Hours:****Unit I**

Internet Structure, Protocols and Access: Internet Protocol Model overview, Internet Addresses, Internet Protocol, Transport Layer, Upper layer Protocols, Internet Access, Internet Applications, About World Wide Web ,Future of Internet and Internet related applications WWW and Web Servers, IIS Configurations and settings, Apache Configuration, Introduction to PWS, Planning a Website. XHTML: Introduction, Forms, Internal Linking, Image Maps, meta, frameset

7

**Unit II**

Cascaded Style Sheet: Inline styles, Embedded Style Sheets, Linking Style Sheets, Text Flow and Box Model. JavaScript: Introduction, Control Structures, Functions, Arrays, Objects.

8

**Unit III**

Dynamic HTML: Object Model and Collection, Event Model, Filters and Transitions, Data binding and Tabular Data Control. XML: XML namespaces, DTDs and schemas, DOM , SAX, XSL, SOAP.

5

**Unit IV**

ASP: Introduction, ASP Objects, FSO, Data Access Object. Building Interactive Animation: Working with Flash and Dream Weaver

6

**Unit V**

Wireless Internet and m-business: Introduction to Wireless Internet, WAP, m-business. e- business and e-commerce. E- Business Models, Building an e-business Application, e-marketing, Security

4

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings<sup>^</sup>:**

1. Deitel Deitel Nieto, Internet and World Wide Web: How to Program, Pearson Education
2. Minoli, Internet and Intranet Engineering, McGraw Hill Education

L= Lecture, T= Tutorial, P= Practical, C= Credit

<sup>^</sup>This is not an exhaustive list

**Course Learning Outcome:**

After successful completion of this course, students will be able to

- understand the importance of power factor and suggest a suitable method for improving it
- suggest and apply suitable electric heating, welding, refrigeration and air conditioning for a system
- analyze and design illumination scheme, electrification, earthing system and protection system for an application

**Syllabus:**

**Electric Heating and Electric Welding:** Advantages of electric heating, Resistance heating, Types of furnaces, Induction heating, Types of induction furnaces, Dielectric heating, Types of welding- arc and resistance.

**Refrigeration and Air conditioning:** Introduction to refrigeration and air-conditioning, Principles of a refrigerator, Domestic refrigerator, Electrical circuit of refrigerator, Need of voltage regulator, Water cooler, Air conditioner, Thermo-electric refrigeration, Air purification, Central air conditioning systems.

**Illumination Scheme:** Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, Types of lighting schemes, Design of lighting schemes, Factory lighting, Street lighting, Flood lighting.

**Electrical Installation, Estimating and Costing:** Types of load, Load assessment, Electrical supply systems, Wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase).

**Power Factor:** Effects of power factor, Causes of low power factor, Disadvantages of low power factor, Methods of improving power factor.

**Electrical Safety Concepts and Criteria:** Electrical shock mechanisms, Factors influencing the electric shock, Body current thresholds (tolerable body current limit), Thevenin's concepts and accidental equivalent circuits (step and touch potentials), Protection against electric shock.

**Earthing Systems:** Purpose of earthing, IS rules for earthing of electrical installations, Factors governing the resistance of earth electrode, Methods of earthing, Measurement of earth resistance, Methods of reducing earth resistance.

**Protective Devices:** Fuse, Miniature circuit breakers (MCB) and Earth leakage circuit breakers (ELCB).

**Self Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**References:**

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.
2. H. Partab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Co.
3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria & Sons, New Delhi.
4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.
5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.
6. N. V. Suryanarayana, Utilisation of Electric Power Including Electric Drives and Electric Traction, New Age Publishers, New Delhi.
7. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria & Sons, New Delhi.
8. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House.

**Course Learning Outcome (CLO):**

At the end of the course, students will be able to -

- understand various data structures and applications associated with them
- analyse efficiency and effectiveness of various data structures
- apply appropriate data structures for time and space optimization

**Syllabus:****Teaching Hours:****Unit I**

10

Introduction to Data Structures: Types of Data Structures, Linear & non-linear Data Structures. Linear Data Structures & their sequential storage representation: Storage Structures for arrays, stack definitions & concepts, operations on stacks, double stack, applications of Stacks-Recursion, Polish Expressions and their compilation, Queue-Representation of queue, operations on queue, priority queues, linked list-linked linear list-operation on linear list using singly linked storage structures, circularly linked list, doubly linked linear list, applications of linked linear list-polynomial manipulation.

**Unit II**

6

Non Linear Data Structures: Trees-Definitions and concepts, operations on Binary Trees, Storage Representation and Manipulation of Binary Trees-Linked & Threaded, Conversion Of General Trees To Binary Trees, Sequential and other representations of trees, applications of Trees-the Manipulation of Arithmetic Expressions, Multi Linked Structures-Sparse Matrices.

**Unit III**

5

Graphs-Matrix: Graphs-Matrix representation of graphs, Breadth First Search, Depth First Search, Spanning Trees. Searching: Searching-Sequential & Binary Searching, Search Trees-Height Balanced, Weight Balance, 2-3 Trees, Tree Structures

**Unit IV**

4

Sorting: Sorting-Notation and Concepts, Time and Space Complexity, Asymptotic behavior, Sorting: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Tree Sort, Quick Sort, Shell Sort, Radix Sort, Address Calculation Sort, Summary of Sorting

**Unit V**

5

Hashing: Hash Table Methods-Introduction, Hashing Functions, and Collision-Resolution Techniques. File Structure: Definition of Record, File, Blocking, Compaction and Database, introductory overview of Database Management System, Implementation and Traders of Sequential Access, Index Sequential Access, Random Access, B-Trees, Inverted List and Multi list.

**Self-Study:**

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

**Laboratory Work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings<sup>^</sup>:**

1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill Edition

L= Lecture, T= Tutorial, P= Practical, C= Credit

<sup>^</sup>This is not an exhaustive list

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand the fundamentals of air pollution, the major collection mechanism and equipments/instruments for a given gaseous or particulate pollutants
- select and apply the most appropriate air pollution control system
- understand the fundamentals of indoor and odour pollution
- understand different methods for controlling emissions from stationary and mobile sources
- apply the concept of air pollution control engineering to the professional society and general public

**Syllabus:**

**Introduction to Air Pollution :** Air pollution in India and the world, sources and classification of air pollutants, global concern of air pollutants, effects of air pollutants.

**Meteorological Aspects of Air Pollution:** Temperature lapse rates and stability, meteorological factors influencing air pollution, plume behavior, dispersion of air pollutants and estimation of plume rise.

**Sampling and Measurement of Air Pollution:** Types of pollutant sampling and measurement, ambient air sampling, stack sampling, analysis of air pollutants.

**Source Correction Methods:** Raw material change, process change, equipment modifications.

**Particulate Control Techniques:** Collection efficiency, particulate control equipments like gravity settling chambers, cyclone separator, filters, electrostatic precipitator, wet scrubbers.

**Control Technologies for Gaseous pollutants:** Scrubbers, absorption and adsorption, control of specific gaseous pollutants like SO<sub>2</sub>, NO<sub>x</sub>.

**Control of Volatile Organic Compounds:** Environmental significance of organic compounds and its control.

**Odor and Its Control Techniques:** Sources and characteristics of odor, measurement and control of odor.

**Indoor Air Pollution:** Indoor air pollutants and its effect, factor influencing indoor air quality, control of indoor air pollutants.

**Air Pollution Legislation and Regulations:** Air quality criteria and emission standards.

**Control of Air Pollutants from Various Sources like Stationary and Mobile source**

**Recent Trends in Air Pollution Control Techniques**

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. Richard W. Bouble, Donald L. Fox, D. Bruce Turner, Arthur C. Stern, Fundamentals of Air Pollution, Academic Press.
2. C. S. Rao, Environmental Pollution Control Engineering, New Age International.
3. M N Rao, H V N Rao, Air Pollution, Tata McGraw Hill.
4. J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, I. K. International.
5. S. C. Bhatia, Textbook of Air Pollution and its Control, Atlantic Publishers & Distributors.
6. R. K. Trivedy, P. K. Goel, An Introduction to Air Pollution, BS Publications.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand project, management functions, planning, monitoring and controlling techniques
- develop network, calculate project duration and optimize time and cost
- **implement resource allocation and control techniques**
- identify, analyze and apply suitable planning and management techniques for project management

**Syllabus**

**Introduction to Management:** History, concept, need for scientific management, scope, functions, engineer as manager.

**Organizational Structure:** Need, types, principle, functions of various personnel, organization as resource.

**Material Management:** Objectives, scope, functions, stages of material management, inventory control.

**Personnel Management:** Special characteristics, man power planning, recruitment, placement, training and induction, motivation, performance appraisal, industrial relation, aspect of administration, motivation, public relation, welfare measures.

**Project Planning and Control:** Project life cycle, identification, budget planning, appraisal, negotiation, approval, detailed planning, implementation, monitoring and control, evaluation, planning techniques and their merits and demerits.

**Network Analysis:** History, Bar chart, CPM and PERT: development of network, time estimates and computation, analysis of network, time-cost trade off, updating and resource allocation.

**Accounting and Financial Management:** Accounting: Concept, objectives, types, principles. Finance Management: Finance as resource, functions, control, cost analysis. Financial statements: Balance sheet, profit and loss account, fund and cash flow statement. Financial Analysis: Financial ratio, types, significance Methods, factors, purpose, financial analysis, cost-benefit ratio. C-V-P analysis: concept, assumption, fixed and variable cost, breakeven point, margin of safety, utility.

**Project Information System:** Need, components, use of computer, implementation, monitoring, reports, schedule and budget, updating, cost and time control.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. Nagarajan, Project Management, New Age International Publishers
2. Harold Kerzner, Project Management: A System Approach to Planning, Scheduling and Controlling, John Wiley and Sons
3. Burke and Rory, Project Management: Planning and Control Techniques, John Wiley and Sons
4. Prasanna Chandra, Financial Management: Theory and Practice, Tata McGraw Hill
5. P Gopalakrishnan, Materials Management, Prentice Hall
- K. Aswathappa, Human Resource Management: Text and Cases, Tata McGraw Hill

**Nirma University**  
**Institute of Technology**  
**B Tech**

**HS001/2HS001, Entrepreneurship Development**

**[3 0 0 3]**

**Objective:** To acquaint the engineering students with the basic concepts of Entrepreneurship with an effort to develop entrepreneurial skill amongst the students.

**Entrepreneurship :** Definition and structure. Entrepreneurial culture, the concept of Entrepreneurship. Entrepreneurial Traits: Entrepreneurial Skills, Qualities and Characteristics of an Entrepreneur, Nature and Importance of entrepreneurs. Entrepreneurship as a career choice. Contribution of entrepreneurs to the Development of the Nation.

**Entrepreneurial Development :** entrepreneurial Environment, Meaning and Process of entrepreneurial Development. Entrepreneurial Development Training, Importance, Objectives and Methods of Training.

**Project Management :** Search for Business Idea, Concept of Project and classification. Project Identification and Formulation. Project Design & Network Analysis. Project Report, Project Appraisal.

**Financial Analysis :** Investment Process, Break even analysis, Budget and Planning Process.

**Sources of Finance :** Sources of Development Finance, Financial Institutions.

**Establishing a small scale Industry:** Location, Steps of Setting up a Small Scale Industry, Selection of Organization.

**Marketing Environment :** Marketing Segmentation, Market Research, Market Planning.

**Text/Reference Books:**

1. A handbook for New entrepreneurs by EDI, Published by Oxford University Press.
2. Dynamics of Entrepreneurial Development and Management – Vasant Desai, Himalaya Publishing House

3. Entrepreneurship Development – Dr. Y.P. Hathi, Dr. Rupesh Vasani, Mahajan Publishing



**Nirma University**  
**Institute of Technology**  
**B Tech**  
**HS003/2HS003 Introduction of Accounting**

**[3 0 0 3]**

**Objective** To understand the various concepts of financial and cost accounting

**Financial Accounts :** Accounting equation, Journal, Cash book, Ledger, Trial Balance, Profit & Loss Account, balance Sheet

**Cost Accounts :** Cost classification (direct cost, indirect cost, variable cost, fixed cost) Prime cost, conversion cost, full cost, Cost - Volume – Profit Analysis, Absorption costing, activity based costing, budgetary control, standard costing.

**Reference Books:**

Accounting for Managers by Jawaharlal TMH  
Accounting Principles by Anthony &bn . Reece, AITB

**Nirma University**  
**Institute of Technology**  
**Department of Mathematics & Humanities**  
**B Tech Sem - VII/VIII**  
**2HS005/HS005, Technical Writing**

**[3 0 0 3]**

**Course Learning Outcome**

After successful completion of the course, student will be able to

- Participate actively in writing activities (individually and in collaboration) that model effective scientific and technical communication in the workplace.
- Understand how to apply technical information and knowledge in practical documents for a variety of a.) professional audiences (including peers and colleagues or management) and b) public audiences.
- Practice the unique qualities of professional writing style, including sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.

**An introduction to technical writing**

- Technical writing vs. General writing b. Purpose, importance and characteristics of technical writing.
- Objectives of technical writing: Clarity, conciseness, accuracy, organization, ethics.
- Audience recognition and involvement: High tech audience, low-tech. audience, gender neutral language.

**Memorandum:**

- Objectives, difference between memos, letters and emails. Criteria and format for writing and memos.

**Technical description:**

- Criteria and process.
- Technical instructions for user's manual

**Report Writing:**

- Characteristics, types and writing of various reports: feasibility reports, inventory report, mishap report, progress report, laboratory report.

**Letter- writing:**

- Business letters, Job-applications, Resume.

**Business Proposals:**

- Types & formats.

## **Graphic representation of Technical Data**

### **SOP writing**

#### **Promotional Writings**

- Technical Brochure designing
- Content writing for Websites (For promotional and troubleshooting purposes)
- Writing Fliers and Newsletters

#### **Academic Writing**

1. Summaries, abstracts and instructions

### **Case studies on Technical Writing.**

#### **Reference Books:**

1. Sharon J. Gerson and Steven M. Gerson, , Technical writing – process and product ,Person Education Asia .
2. Andrea J. Ratherford ,Basic Communication Skills for Technology,Person Education Asia
3. Pfeiffer, W.S. and T.V.S.Padmaja. Technical Communication. Pearson
4. Muralikrishna and Sunita Mishra. Communication Skills for Engineers. Pearson

**Nirma University**  
**Institute of Technology**  
**B Tech**  
**HS006/2HS006, Element of Marketing Management**

**[3 0 0 3]**

- Objective:** To acquaint the engineering students with the basic concept of marketing management.
- Marketing:** Concept of marketing, core marketing concepts, importance and scope of marketing, company orientation towards market place
- Product:** Product and product mix, importance of product, product objective, product strategy planning for new product
- Market Environment:** Demographic, Economic natural, Technical, Political, legal, social cultural **Consumer Buying Behaviour:** Influences on buyer behaviour, buying decision process, Market segmentation – levels, pattern and procedure
- Distribution channels :** Importance and factors of distribution channels, types of channels, channels of distribution – consumption good, industrial goods, nature and type of retailers Function and type of wholesalers, selecting distribution, channels
- Pricing:** Nature and Importance of pricing, objectives of pricing. Considerations in price determination approaches to pricing.
- Promotion:** Promotion and its elements, objectives of promotion, promotion mix
- Market research:** Nature and scope, process of market research, uses and limitations

**Text/Reference Books:**

Marketing Management – Philip Kotler, PHI  
Marketing Management – Rajan Saxena, TMH  
Organization and management – R.D. Agrawal, TMH

**Nirma University**  
**Institute of Technology**  
**B.Tech**  
**HS014/ 2HS014, Banking & Finance**

[3 0 0 3]

<b>Objective:</b>	To understand the various concepts of banking and financial system
<b>Indian Financial System:</b>	The Financial System, Nature, Evolution and Structure, the Functions of Financial Intermediaries, Financial Instruments, the Role of Financial System in Economic Development, the Indian Financial System. The Origin and Growth of Banking of Banking, Functions of Commercial Banks,, Banking in the New Millennium.
<b>Banker Customer Relationship:</b>	Types of Accounts, Types of Relations, KYC Norms, Banker –Customer relationship, Rights and Duties of Banker/ Customer, Importance provisions of NI Act
<b>Sources &amp; Uses of Funds:</b>	Bank Balance sheet, Sources & Uses of Funds in a Bank. Form of Balance Sheet of Banking Companies. Different Schedule under Banking Regulation Act. – Provisioning norms of CRR & SLR
<b>Deposit Management:</b>	Importance of Deposit, Types of Deposit in India, USA & Europe. NRI Deposits, Cost of Deposit & its impact on Profitability, concepts of Fixed & Floating Rate of Interest, Deposit Insurance.
<b>Cheques:</b>	Special Features Negotiability, Validity, Crossing & Endorsement.
<b>Cash Management:</b>	Importance of Cash Management issues, Cash at Counter, Vault & Currency Chest.
<b>Lending Activities :</b>	Lending activity, Basic requirements for lending.
<b>Credit Policy:</b>	Need for Credit Policy, Components of Credit Policy, Credit Policy Pursued by the Government, Bench Marks Exposure Norms, Credit Culture.
<b>Retail Banking:</b>	Basics of Retail Banking, Forms of Retail Banking and Emerging issues
<b>Corporate Banking:</b>	The nature of corporate banking, Developments in corporate banking, Consortium finance, Multiple banking arrangements, and Loan syndication

**Feebased Services:** Feebased Services L/C,B/G, Subsidiary services, Bancassurance, Demat Account, Safe Deposit Locker , Mutual Funds, Merchant Banking Activities – Management of Public issues, Reasons, Eligibility norms, Regulatory framework, Marketing of issues, Post issue activities

**Plastic Money:** Different types of plastic money, Concept of a credit card, Distinction between Credit card, Charge card and Debit card, Mechanics of a credit card transaction, Credit card as an augmented retail financial product, Credit card business in India, The merging scenario CRM, (AWB, ATM, Mobile Banking Internet Banking) Delivery Channels (Payment & settlement services)

**Reference Books:**

1. Management of Banking & Financial Services - Paul, Justin / Suresh, Padmalatha. Pearson – 2007
2. Financial Institutions and Markets, 4<sup>th</sup> e Bhole, LM. Tata McGraw Hill 2004
3. Indian Financial System, Theory and Practice, 4<sup>th</sup> e, Khan, M Y. Tata McGraw Hill 2004

**Nirma University**  
**Institute of Technology**  
**Department of Mathematics & Humanities**  
**B Tech Sem - VII/VIII**  
**2HS016/HS016, Applied Literature**

**[3 0 0 3]**

**Course Learning Outcome**

Students completing this subject will:

1. be able to explore the importance of textual traditions in shaping responses to other places, peoples, cultures;
2. gain a knowledge and understanding of the social, political and intellectual forces contributing to imperial, third world and migrant writing;
3. develop a knowledge and appreciation of the subject matter, styles and narrative conventions

**Syllabus**

**Non-fictional Prose Works (Excerpts)**

**New Branded World** by Naomi Klein

From the Gutenberg Elegies: The Fate of Reading in the Electronic Age by Sven Birkets

Decolonising the Mind by Ngugi wa Thiong'o

Idea of India by Sunil Khilnani

Wings of Fire by APJ Kalam

**Poems**

Night of the Scorpion by Nissim Ezekiel

Little Red-Cap, by Carol Ann Duffy

Hunger by Jayanta Mahapatra

The Dacca Gauzes by Agha Shahid Ali

The Howl by Allen Ginsberg

If you forget me by Pablo Neruda

Still I rise by Maya Angelou

If by Rudyard Kipling

“Hope” is the thing with feathers by Emily Dickinson

All You who Sleep Tonight by Vikram Seth

The Unknown Citizen by W. H Auden

Song of Myself, I, II, VI & LII by Walt Whitman

**Short Stories**

Short Story: “Seventeen Syllables” by Hisaye Yamamoto

Short Story: “The Gift of the Magi” by O. Henry

**Criticism**

**Towards a Feminist Poetics** by Elaine Showalter

## **Movies**

The Prestige  
To Sir, With Love  
The Namesake  
Sherlock – TV series  
Troy  
Jobs

## **References:**

1. Widdowson, Peter. *Literature*. London: Routledge, 1999.
2. Miller, J. Hillis. *On Literature: Thinking in Action*. London: Routledge, 2002.
3. Mulhern, Francis, *Culture/Metaculture*. London: Routledge, 2000.
4. During, Simon, *The Cultural Studies Reader*. London: Routledge, 1993.
5. Leitch, Vincent B. *The Norton Anthology of Theory and Criticism*. Norton: New York, 2001.
6. Stam, Robert; Alessandra Raengo, *A Companion to Literature and Film*. Blackwell: Oxford, 2004.



**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand the fundamental principles of Programmable logic controller, I/O modules
- develop the ability to design program using standard programming technique
- develop and design an application orientated project using PLC

**Syllabus:**

**Introduction:** Definition, advantages and Importance of PLC, Evolution history of PLC, Architecture and block diagram.

**PLC hardware :** Types of PLC, CPU unit architecture, Input/Output devices and interfacing, Hand held programming terminals, Industrial computer and monitors,

**PLC operation:** Ladder logic, Logic functions, Wiring diagram

**PLC Programming:** Basic relay instructions, timer-counter instructions, comparison, data handling, input-output instructions, sequencer instruction

PLC applications and case studies.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study

**References:**

1. Webb and Reis, Programmable Logic Controllers, Principles and Applications.
2. Mitra and Gupta, Programmable Logic Controllers and Industrial Automation an Introduction.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- understand the basic working of microcontrollers
- program the 89CXX controller in C and assembly language
- interface and analyze the 89CXX based circuits
- design and develop systems based on 89CXX microcontrollers

**Syllabus:**

**Architecture of 89CXX series microcontroller:** Micro controller Hardware, Input /Output Pins, Ports and Circuits, External Memory, Counter and Timers, Serial Data Input/Output, Interrupts, Basic Assembly Language Programming Concepts

**Data Transfer Operations:** Addressing Modes, External Memory Read-Only Data Moves, Push and Pop Opcodes, Data Exchanges

**Arithmetic & Logical Operations:** Flags, Incrementing and Decrementing, addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Byte-Level Logical Operations, Bit-Level Logical Operations, Rotate and Swap Operations

**Jump and Call Instructions:** Jump and Call Program Range, Jump, Calls and Subroutines, Interrupts and Returns, More Details on Interrupts

**C Programming for microcontroller:** Data types and time delay in 89CXX Controller, I/O programming, Logic operations, Data conversion programs, Accessing code in ROM space, Data serialization.

**The Microcontroller Based Design:** A Microcontroller Design, Testing the Design, Timing Subroutines, Lookup Tables for the 8051, Serial Data Transmission Applications Keyboards, Displays, Pulse Measurement, D/A and A/D Conversions, Multiple Interrupts Serial Data Communication Network Configurations, Data Communication Modes

**Applications of Microcontroller:** Stepper motor control, PMDC motor speed control, RTC interfacing, Relays and alarms interfacing with microcontroller, frequency calculation, pulse width calculation, temperature indication using microcontroller

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study

**References:**

1. K.J.Ayala, The 8051 Micro controller, Architecture, Programming and Applications, , Penram International Publication.
2. Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 8051 Microcontroller and Embedded Systems , Pearson Higher Education Publication.
3. Myke Predko, Programming and Customizing the 8051 Microcontroller, McGraw-Hill Publication.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- apply the concept of robotics to select the type of manipulator best suitable to the application
- formulate the mathematical relations for kinematic analysis of robotic manipulator.
- integrate the structural design, actuator selections, drive system, sensor and control system necessary to implement a robot in a specific job task

**Syllabus:****Robot technology:**

Fundamentals of Robots: Introduction, fundamentals of robot technology, classification, applications, Systems overview of a robot, basic components, control system and components

**Robot motion analysis and control:**

Robot arm kinematics, Forward & inverse kinematics solutions, Trajectory design.

Lagrange-Euler formulation, Newton-Euler formulation, Generalized D'Alembert equation of motion, robot arm dynamics.

**Actuators and sensors in Robot-** AC/DC motors, stepper motors and servo motor, direct drive robot, Hydraulic and pneumatic systems.

Internal sensors, Position, Velocity, Acceleration, Proximity sensors, Touch and Slip sensors, Force and Torque sensors, External sensors, contact and non contact type like Vision, ranging, laser, acoustic, tactile etc. sensor selection and control.

**Robot programming & languages.****Types of End Effectors and Design**

End effectors , Classification , Force analysis and Gripper design.

Introduction to Mobile robots, Robot Intelligence and Task Planning, Modern Robots, Future Application and Challenges.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. Richard D. Klafter, Thomas A Chmielewski and Michael Negin, Robotics Engineering: An integrated approach, Prentice Hall
2. Mittal and Nagrath , Robotics & Control , Tata McGraw-Hill Publishing Company Ltd., New Delhi
3. John Craig , Introduction to Robotics, mechanics and control, Pearson Education, New Delhi
4. M.P. Groover, Mitchell Weiss, Roger N. Nagel & Nicholas Godfrey, Industrial Robotics. Tata McGraw Hill Education Pvt. Ltd
5. Ashitava Ghoshal, Robotics Fundamental Concepts & Analysis, Oxford University Press.

**Course Learning Outcome:**

After successful completion of the course, student will be able to

- describe various methods to produce low temperature and phenomena at cryogenic temperature.
- understand the working principle of different cryogenic refrigeration and liquefaction system.
- understand the functions and working principles of insulations and various low temperature measuring and storage devices.
- understand the application of cryogenic technology in engineering research and industry.

**Syllabus:**

**Low Temperature Properties** – Mechanical, thermal, electrical and magnetic properties of engineering materials, properties of cryogenic fluids.

**Gas Liquefaction Systems** – Thermodynamically ideal system, Joule Thomson effect adiabatic expansion, simple, pre-cooled and dual pressure Linde Hampson systems, Claude system, Kapitza system, Heylandt system, other liquefaction system using expanders, comparison of liquefaction systems, liquefaction systems for hydrogen and helium

**Cryogenic Refrigeration Systems** – Ideal isothermal and isobaric source systems, Joule Thomson systems, pre-cooled Joule Thomson system, expansion engine system, Philips refrigerator, G M refrigerator, Pulse Tube refrigerator.

**Measurement Systems for Low Temperatures** – Temperature, pressure flowrate and liquid level measurement at low temperatures.

**Cryogenic Fluid Storage** – Basic storage vessel, construction of storage vessels for oxygen, hydrogen, nitrogen, helium, safe devices, drawing of the vessel.

**Insulations** – Gas filled powder and fibrous, vacuum, evacuated powder and fibrous, multiplayer insulations, mechanism of thermal insulation, apparent thermal conductivity, and selection of insulation

**Cryogenic Fluid Transfer Systems** – Different types of transfer lines, process of cryogenic transfer, components of transfer lines.

**Application of Cryogenic Systems** – Super-conducting bearing, motors, super-conducting magnets, space technology, blood and tissue preservation, cryo probes used in cryo surgery.

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**References:**

1. R.F. Barron, Cryogenics systems, Mc Graw Hill Publication.
2. T.Flynn, Cryogenic Engineering, Springer Publication

**Course Learning Outcome:**

After successful completion of the course, student will be able

- To understand the importance of Renewable Energy Sources in the present era.
- To describe various methods for power generation by using different type of Non-conventional and renewable energy sources.
- To apply the knowledge of converting energy resources like solar, wind, biomass, tidal, wave, ocean thermal, and geothermal energy for power generation.
- To understand the working and applications of fuel cells and usage of bio-fuels.

**Syllabus:**

Energy scenario of India and World, Need of Renewable Energy sources

Solar energy, extra-terrestrial and terrestrial radiations, radiation geometry, variation of insolation and its measurement, computation of solar radiation on horizontal and tilted surfaces, solar flat plate collectors, their configuration, material of construction and general characteristics, concentrating collectors, receiver systems, heliostat, optical losses, types of solar energy storage, solar energy applications.

Wind energy, analysis of wind speeds, different types of wind turbines, use of meteorological data for site selection, materials of construction, performance characteristics, and applications

Biomass, energy plantation, biomass gasifiers, types, construction of biogas plants, scope and future

Tidal, wave and ocean thermal energy conversion plants, geothermal plants, small hydro plants, magneto hydrodynamic plants, fuel cells, use of non-conventional fuels, bio fuels and their applications

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

**Reference Books:**

1. Non-conventional Energy Sources by G.D.Rai, Khanna Publishers
2. Renewable Energy Resources by John Twidell and Tony Weir, Taylor and Francis
3. Solar Energy Utilization by G.D.Rai, Khanna Publishers
4. Solar Energy by S P Sukhatme, Tata McGraw Hill Education Private Limited
5. Energy Technology by Rao and Parulekar, Khanna Publishers
6. Wind Energy Technology by Walker and Jenkins, Wiley-Blackwell

## Civil Engineering Department

University Electives offered by Civil Engineering Department to be made effective from academic year 2015-16

**UEIT009      Environmental Conservation for Sustainable Development      [3 0 0 3]**

### Course Learning Outcome:

After successful completion of the course, student will be able to

- identify and analyse environmental issues related to developments and address suitable mitigation measures
- comprehend and formulate appropriate environmental pollution control methodology
- identify and assess environmental hazards, consequences and safety provisions
- select and evolve appropriate environmental monitoring and management strategies

### Syllabus:

**Developmental Activities and Environmental Issues:** Environmental issues arising from developmental activities, nature and characteristics of environmental impacts of urban and industrial developments. Need for technological inputs addressing the multi-disciplinary nature of environment leading to sustainable development.

**Environmental Pollution – Assessment and Control:** Constituents, types, assessment and control of environmental pollution. Environmental indices and modelling tools for prediction and assessment of environmental quality. Fundamental pollution control systems, methodologies, operation and maintenance.

**Environmental Health and Safety:** Basic concepts and terms of environmental risk, identification and assessment procedures. Consequence and analysis of environmental and health hazards.

**Environmental Monitoring and Management for Sustenance:** Environmental management systems, monitoring and control of undesirable environmental implications. Linkages between technology, emission trading, economic gain and societal goals for sustainable development. Environmental cost benefit analysis, decision methods for evaluation of environmentally sound alternatives. Environmental regulations and legislation, international resource sharing issues, treaties and protocols.

### Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### References:

1. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering, McGraw-Hill International Editions-Civil Engineering Series
2. Larry W. Canter, Environmental Impact Assessment, McGraw-Hill International Editions
3. Environmental Concerns and Sustainable Development: Some perspectives from India, Sakarma Somayaji, Ganesha Somayaji, TERI Press
4. G. Bruce Wiersma, Environmental monitoring, CRC Press
5. Nicholas P. Cheremisinoff, Madelyn L. Graffia, Environmental Health and Safety Management: A Guide to Compliance, Jaico Publishing House

## University Elective Course (Institute of Architecture and Planning)

L	T	P	C
1	-	3	3

Course Code	UEIA001
Course Title	GIS AND REMOTE SENSING

### Course Learning Outcomes (CLO):

At the end of the course Students will be able to -

- Develop understanding about database management.
- Display data in maps.
- Acquire fundamental knowledge of Remote Sensing through Satellite imageries.
- Gain insights on application of GIS and Remote Sensing in Planning.
- 

Teaching hours: 60

### Syllabus:

#### Unit 1: Database Management and Data Analysis

Hours: 12

- Fundamental concepts of Database Management System
- Query Building
- Understanding the usage of ArcTool Box
- Creating Charts and graphs
- Statistics Summary
- Using Field Calculator
- Calculate Geometry
- Buffering or Proximity Analysis
- Overlay Analysis
- 3D, spatial and statistical analysis
- Land Matrix
- Land Utilization
- Cloud Computing
- Crowd Sourcing

#### Unit 2: Displaying Data in Maps and Map Elements

Hours: 16

- Symbology
- Labeling and Annotation
- Creating Map Layout
- Inserting Map Scale; Legend Map; Title; North Symbol; Creating Grids; Other map Elements and Saving a Layout.
- Conducting a Land Suitability Analysis using GIS, Introduction to new concepts like cloud computing, crowdsourcing etc.

- Unit 3: Remote Sensing and Photo Interpretation Hours: 16
- Remote Sensing -Definition, Aerial and Satellite Remote Sensing; Aerial Photo- Interpretation, Qualitative and Quantitative Elements of Photo- Interpretation
  - Satellite Remote sensing, Geo-Stationary and Sun-Synchronous Satellites, Principles of Electro-Magnetic Radiations, Resolutions
  - Introduction to Digital Image Processing
  - Salient Features of Popular Remote Sensing Satellites; Applications in Planning
  - Laboratory Exercises

- Unit 4: Photogrammetry Hours: 08
- Limitations of Traditional Surveys for Planning
  - Photogrammetry as an Alternative Tool for Surveying
  - Aerial Photographs, Classification
  - Principles of Stereoscopic Vision
  - Basic instruments -Stereopair, Pocket and Mirror Stereoscopes, Parallax Bars
  - Principles of Photogrammetry, Measurement of Heights and Depths
  - Introduction to Digital Photogrammetry

- Unit 5: Planning Information Systems in India Hours: 08
- Introduction to Spatial Data Infrastructure, NNRMS, NUIS, National Urban Observatory, Municipal Information Systems, Land Information Systems, Cadastre Systems
  - Applications and Limitations
  - Tools for Spatial Data Handling,
  - BHUVAN
  - Agencies responsible for generating spatial data.

Suggested Readings:

- “National Atlas and Thematic Mapping Organisation” (NATMO) Publications
- Andrew Skidmore et al, “*Environmental Modelling with GIS and Remote Sensing*”, CRC Press
- Basdudeb Bhatta, “*Remote Sensing and GIS*”, Oxford University Press
- David J Maguire et al, “*GIS, Spatial Analysis, and Modelling*”, ESRI Press
- Mesfin T Bekalo et al, “*Landuse Change Detection using GIS, Remote Sensing and Spatial Matrices*”, Lap Lambert Academic Publications
- Mezenzia Mengist, Vdm Verlag, “*Lans Sustainability Evaluation using GIS and Remote Sensing Technology*”,
- Netzband, “*Applied Remote Sensing in Urban Planning, Governance and Sustainability*”, Springer, India
- PA Longley et al, “*Geographic Information Systems and Science*”, John Wiley and Sons Ltd.
- Qihao Weng, “*Remote Sensing and GIS Integration: Theories, Methods and Applications*”, McGraw Hill Professional
- Satheesh Gopi, “*Advanced Surveying: Total Station, GIS and Remote Sensing*”, Pearson
- Thomas M Lillesand et al, “*Remote Sensing and Image Interpretation*”, John Wiley and Sons Ltd.



**NIRMA UNIVERSITY  
INSTITUTE OF LAW**

**University Elective Course  
Academic year 2015-16**

**Information Technology and Cyber Law**

Teaching Hours: 45

Credit: 3

**I Introduction**

The rapid growth of computer technology makes our life easier and attracts us to make every transaction by using electronic sources. All of us use computer every day through personal computer, laptop, mobile phone, notebook, etc. On the other hand unemployed persons are attracted to involve in unethical and unsocial activities, even in some of the cases, it extend to criminal activities. This course will disseminate the knowledge of computer technology which use cyberspace to transact the text, photo, documents, videos, money, etc. The course will also develop their ability to link internet technology with legal principles in fixing the tortious liabilities of the wrongdoer to compensate the victim and criminal liabilities of the offenders after following the due process of law. The Course will create ability among the students to apply Indian Information Technology Act in regulating E-Commerce, E-Governance, E-Banking and cybercrimes.

**II Course Learning Outcome:**

After the completion of the course the students will be able to:

1. Understand the information technology with technical & social perspectives.
2. Analyses the critical issues in developing cyber jurisprudence & policy.

**III Syllabus**

**Module 1: Information Technology**

What is Networking and Internet? What are various Computer Technologies used in Networking? What is relation between Computer Web Technology? , Types of networks; Intranet and internet, Understanding Internet, www, Computer Memory and Storage, What is relationship between Cyberspace, Technology and Law, Defining the Scope of Information Communication Technology.

# 10

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## Module 2: Stakeholders in cyber world

Defining the expansion of Cyber World & IT Industry, Who are Users (subscribers), Service Providers, Intermediaries, Cyber Cafe and other stakeholders. What kind of Agreements are Regulating Stakeholders Relationships: Click Wrap, Shrink Wrap, EDI. Discussing Electronic Contracts regulations in Indian & Cross Border Contracts (Reference to IT Act 2000 & UNCITRAL Model Law)

## Module 3: Issues related to Software and Web designing

What are various IPR Issues in Cyber Space?, What is Domain Name Dispute, Cyber Squatting, What is Meta-Tagging, Framing and linking issue, Understanding Issues related to copyright, trade name and trademark infringement in IPR Law, Issues relating to Biotechnology and ICT related to software copyright, software privacy, open source software.

## Module 4: Regulating Information Technology

How Authentication of electronic Records is done?, what digital signature? & how it is different from electronic signature?, what are regulatory powers of Controller and Certifying authorities?, Understanding, E-governance, E-commerce, E-banking including mobile banking, What are Civil liabilities under IT Act, Who is Adjudicating officer & What is Cyber Regulation Appellate Tribunal.

## Module 5: Cyber Crimes

What is Cyber Crimes & what are its various classifications?, Appraisal of Crimes targeting Commuters, Social crimes committed through internet, Cyber pornography and stalking, Personal crimes, Economic offenses and Social Networking, Terrorist activities through internet. What are various measures taken by government to prevent cybercrimes?

## Module 6: Investigation of cyber crimes

How investigation of cybercrime is done? Who is responsible for Cyber Crime Investigation? What are Territorial powers and issues, Confiscation of the computer and other e-devices? What is Computer and cyber forensics, discussing the Admissibility of E-Evidence in court of Law?

## Module 7: Issues and challenges to cyber law

Discussing the Relevance of Data Protection Laws & Cyber Security, Legal recognition of Digital Evidence, Recognition of liability in the digital world, deciphering the Jurisdiction Issues in Transnational Crimes, What is Cloud Computing & what is its regulatory structure, Issue of Communication Convergence, Relevance of Online Dispute Resolution in India.

**V Reference :**

- ☞ SURYA PRAKASH TRIPATHI, RITENDRA GOEL AND PRAVEEN KUMAR SHUKLA, INTRODUCTION TO INFORMATION SECURITY AND CYBER LAWS, WILEY INDIA PRIVATE LIMITED, 2014 (Technical Approach)
- ☞ APAR GUPTA, COMMENTARY ON INFORMATION TECHNOLOGY ACT, LEXIS NEXIS INDIA; (2<sup>nd</sup> ed.) (2011).
- ☞ PAVAN DUGGAL, CYBER LAW - AN EXHAUSTIVE SECTION WISE COMMENTARY ON THE INFORMATION TECHNOLOGY ACT ALONG WITH RULES, REGULATIONS, POLICES, NOTIFICATIONS ETC., Universal Law Publishing Co. Pvt Ltd., (2014)
- ☞ CYBER LAWS, JUSTICE YATINDRA SINGH, Universal Law Publishing Co., (2010).
- ☞ PAVAN DUGGAL, TEXTBOOK ON CYBER LAW, Universal Law Publishing Co. Pvt Ltd., (2014)
- ☞ AJIT NARAYANAN AND BENNUM (ed.): LAW, COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE.
- ☞ LINDA BRENNAN AND VICTORIA JOHNSON, SOCIAL, ETHICAL AND POLICY IMPLICATION OF INFORMATION TECHNOLOGY.
- ☞ KARNIKA SETH, COMPUTER INTERNET AND NEW TECHNOLOGY LAWS, LEXISNEXIS, (1<sup>st</sup> Edition) (2013).
- ☞ KAMATH NANDAN, LAW RELATING TO COMPUTERS INTERNET & E-COMMERCE (A GUIDE TO CYBER LAWS & THE INFORMATION TECHNOLOGY ACT, 2000 WITH RULES & NOTIFICATION), (5<sup>th</sup> Edn., Universal Book Traders), (Reprint 2004).
- ☞ ARVIND SINGHAL AND EVERETT ROGERS, INDIA'S COMMUNICATION REVOLUTION : FROM BULLOCK CARTS TO CYBER MARTS.
- ☞ MIKE GODWIN, CYBER RIGHTS DEFENCING FREE SPEECH IN THE DIGITAL AGE

**Additional Sources :**

- Talwant Singh Addl. Distt. & Sessions Judge, Delhi, *Cyber Law & Information Technology* <http://delhicourts.nic.in/CYBER%20LAW.pdf>
- *New Crimes Under The Information Technology (Amendment) Act* [http://www.ijlt.in/archive/volume7/5\\_Mohanty.pdf](http://www.ijlt.in/archive/volume7/5_Mohanty.pdf)
- *(A to Z of cyber crime by Asian School of cyber laws available at* <http://ensaiosjuridicos.files.wordpress.com/2013/06/122592201-cybercrime.pdf>)
- Louise Ellison and Yaman Akdeniz, *Investigating Cyber Law and Cyber Ethics: Issues, Impacts, and Practices, Cyber-stalking: the Regulation of Harassment on the Internet* [http://www.cyber-rights.org/documents/stalking\\_article.pdf](http://www.cyber-rights.org/documents/stalking_article.pdf)
- Cyber Crimes and Information Technology
- <http://www.nalsar.ac.in/pdf/Journals/Nalsar%20Law%20Review-Vol.%204.pdf>
- *A Study of the Privacy Policies of Indian Service Providers and the 43A Rules*
- <http://cis-india.org/internet-governance/blog/a-study-of-the-privacy-policies-of-indian-service-providers-and-the-43a-rules>



- *Relationship Between Privacy and Confidentiality*
- <http://cis-india.org/internet-governance/blog/relationship-between-privacy-and-confidentiality>
- *Availability and Accessibility of Government Information in Public Domain*
- <http://cis-india.org/accessibility/blog/availability-and-accessibility-of-government-information-in-public-domain>
- *Cloud Computing in India: The current Legal regime and the main Issues and Challenges* : <http://www.indialawjournal.com/volume7/issue-1/article3.html>

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**NIRMA UNIVERSITY  
INSTITUTE OF LAW****University Elective Course  
Academic year 2015-16****Forensic Science and Law**

Teaching Hours: 45

Credit: 3

**I INTRODUCTION:**

The functioning of a criminal justice system depends on the principle of proving the guilt beyond reasonable doubt. It is believed that punishment should be awarded only when there is substantial proof that the person being convicted has an established guilt in the matter concerned. For this purpose, evidence is generated that provides for the involvement of a person in a particular act. Evidence is the arena wherein the concept of forensic science comes into play. Forensic science is that branch of science which provides practical application of scientific technology to investigate criminal or legal matters. The Indian Criminal Justice system is an adversarial system which means there are two parties, and both of them present their cases and the court decides the case on the basis of evidence provided by the parties. Forensic science is resorted to for the purpose of attaining a lead as to involvement of the person in question or for that matter identification of any other person who may have been involved. This course tries to analyse involvement of forensic science in criminal justice system with relate to Quality in Forensic Science, Importance of crime scene, Preservation of crime scene. Issue of admissibility, the increasing role of scientific technique, admissibility standards for expert evidence, to name a few.

**II COURSE LEARNING OUTCOME:**

After the completion of the course the students will be able to:

1. Understand and describe the underlining concepts of forensic science
2. Identify and articulate the emerging issues in forensic evidence.
3. Analyse the benefit and cost of using new scientific technique in criminal investigation.
4. Evaluate the issues relating to admissibility of forensic evidence in a court of law.

**III SYLLABUS:****1. Scene of crime and sight of Law**

This unit examines a number of critical issues associated with the collection of forensic evidence at the crime scene such as quality in Forensic-Science, importance of crime scene, preservation of crime scene. Exploring these areas by keeping in mind that the crime scene is one of the most crucial aspects of an investigation and that the scene of the crime is where collection of forensic evidence begins.

*Paul* *22*

## 2. Proved beyond doubt? Scientific Technique in Criminal Investigation

This unit examines the science of DNA identification, Brain finger printing, Lie Detector Test, Narco Analysis Test and its use during criminal investigations and in criminal proceedings, including criminal trials, appeals and post-conviction proceedings. This unit try to analyse the main benefits and costs of the increasing role of scientific technique in the criminal justice system with special emphasis to India and the challenges of these technologies in future.

## 3. Scientific Evidence in Court of Law

Development of scientific and technical expert testimony in the complex and technical issues has flooded the judicial system, the question of its reliability and admissibility has also plagued the courts and engendered much debate. This unit try to analyse the issue of admissibility which has attracted the attention of countless commentators and the offered arguments supporting greater or lesser barriers to the admissibility of scientific expert evidence.

## 4. Need for caution: Problematic Pitfalls

This unit discusses *Daubert* in a new context, using the Indian case of *State of Maharashtra v. Sharma* as an example of how unreliable, questionable evidence can penetrate the courtroom when admissibility standards for expert evidence do not keep it at bay. This unit also analyses *Daubert* against the backdrop of rapidly emerging technologies and highlights the fact that courts can expect to confront increasing amounts of technical expert evidence in the future.

## 5. Scientific race and legal pace: struggle of catching up

In addition to the conventional areas of study mentioned in the above units, this unit tries to explore the field of forensic science which constantly expands to include many additional areas of expertise include analyses of bloodstain pattern interpretation, forensic engineering, forensic cyber technology, and criminal personality profiling, forensic economics, forensic photography, forensic radiology, and forensic accounting. Further this unit also tries to understand emerging specialty known as forensic security with which today's loss prevention manager must become quite familiar if he or she is to successfully respond to the growing challenge of premises liability for negligent security litigation facing today's businesses, corporations, and commercial/ residential landlords from a broader perspective.

## IV REFERENCES:

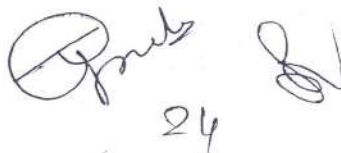
- Henry C. Lee, *Forensic Science and the Law*, 25 CONNECTICUT LAW REVIEW (1117-1125) (1993).
- Michael J. Saks & Jonathan Koehler, *The Individualization Fallacy in Forensic Science Evidence*, 61, VANDERBILT LAW REVIEW (pp199-219) (2008).

*Goswami*

- John I. Thornton, *Uses and Abuses of Forensic Science*, Vol. 69 AMERICAN BAR ASSOCIATION JOURNAL(pp 289-292) (1983).
- Foster William L, *Expert Testimony- Prevalent Complaints and Proposed Remedies*, 11(3), HARVARD LAW REVIEW(pp169-186) (1897)
- Alldrige Peter, *Forensic Science and Expert Evidence*, 21(1), JOURNAL OF LAW AND SOCIETY(pp 136-150) (1994).
- Brigham John C., *What is Forensic Psychology, Anyway?* 23(3), LAW AND HUMAN BEHAVIOUR(pp 273-298) (1999).
- Diamond Bernard L., *Inherent Problems in the Use of Pre-trial Hypnosis on a Prospective Witness*, 68(2), CALIFORNIA LAW REVIEW (pp 313-349) (1980).
- Tovino Stacey A., *Imaging Body Structure and Mapping Brain Function: A Historical Approach*, Vol.33, AMERICAN JOURNAL OF LAW AND MEDICINE (pp 193-228) (2007).
- Lyndia D., Johnson, *Guilty or Innocent-Just Take a Look at My Brain: Analysing the Nexus between Traumatic Brain Injury and Criminal Responsibility*. Vol. 37 (1): SOUTHERN UNIVERSITY LAW REVIEW. (pp 25-40) (2009).
- Danielle, Andrewartha , *Lie Detection in Litigation: Science or Prejudice (article)*. Vol.15(1): PSYCHIATRY PSYCHOLOGY AND LAW.(pp 88-104) (2008).
- Robbert L. Collins, *Improved Crime Scene Investigation*, JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLITICAL SCIENCE.
- Whitman Glen, Koppl Roger, *Rational Bias in Forensic Science*, 9, OXFORD JOURNAL: LAW, PROBABILITY & RISK. (pp 69-90) (2010)
- Williams John F, *Trace Evidence*. 49, THE JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLICE SCIENCE. (pp 285-288) (1958).
- Kingston Charles R., *Application of Probability Theory in Criminalistics*, 60, JOURNAL OF AMERICAN STATISTICAL ASSOCIATION. (pp 70-80) (1965).
- Rao Dr. G.V., *DNA Testing: Mere match is not conclusive proof unless statistics corroborate*, 118, CRIMINAL LAW JOURNAL (October 2012)
- Gupta Mohit, *Digital Forensics, Hacking and its Role in Crime Investigations*, MEDICO LEGAL UPDATE (pp98-100)
- Celine Weyermann, Olivier Ribaux, *Situating forensic traces in time*, JOURNAL OF THE FORENSIC SCIENCE SOCIETY SCIENCE AND JUSTICE, 52, (pp68-75) (June 2012).
- John W. Bond, *The value of fingerprint evidence in detecting the crime*, INTERNATIONAL JOURNAL OF POLITICAL SCIENCE AND MANAGEMENT Vol.11 (77-82)
- Stan Brown and Sheila Willis, *Complexity in Forensic Science*, Vol.(1:4), FORENSIC SCIENCE POLICY AND MANAGEMENT: AN INTERNATIONAL JOURNAL (pp 192-198) (2010).
- Roach Kent, *Forensic Science and Miscarriage of Justice: Some lessons from Comparative Experience*, Vol.50, JURIMETRICS, (pp 67-92) (2009)

#### Reference Books:-

- MAHENDRA SINGH ADIL, SCENE OF CRIME- CRITICAL ROLE AND USAGE OF SCENE OF OCCURRENCE IN TRIAL,(Capital Publishing House, Delhi.)

  
24

- GROSS'S CRIMINAL INVESTIGATION, (5<sup>th</sup> Edition, Universal Law Publishing Co. 3<sup>rd</sup> Indian Reprint, Delhi) (2008).
- SHARMA B.R., SCIENTIFIC CRIMINAL INVESTIGATION, (Universal Law Publishing Co., Delhi) (2006).
- K. MATHIHARAN AND AMRIT K PATNAIK, MODI'S MEDICAL JURISPRUDENCE AND TOXICOLOGY, (23<sup>rd</sup> Edition, Lexis NexisButterworths).
- EDWARD HUESLE, FIREARMS AND FINGERPRINTS, ESSENTIALS OF FORENSIC SCIENCE, (1<sup>st</sup> Indian Edition, Viva Books Private Limited, New Delhi) (2007)
- MAX M HOUCK, TRACE EVIDENCE, ESSENTIALS OF FORENSIC SCIENCE-(1<sup>st</sup> Indian Edition, Viva Books Private Limited, New Delhi) (2007).
- JYOTIRMOY ADHIKARY, DNA TECHNOLOGY IN ADMINISTRATION OF JUSTICE (Lexis NexisButterworths, New Delhi) (2007)

*Pradeep*



**NIRMA UNIVERSITY  
INSTITUTE OF LAW  
Academic Year: 2016-17  
University Elective  
Introduction to the Indian Constitution**

**Credit: 3  
Hours: 45**

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3	-	-	3

**Introduction:**

India is a democracy and her Constitution seeks to establish its fundamental organs of government and administration, describe their structure, composition, powers and principal functions, define democracy through relationship of the organs with one another and with the people. The Constitution also guarantees certain Fundamental Rights to its citizens that are not to be infringed by the Government. A good understanding of the Constitution and the law, which has developed through constitutional amendments, judicial decisions, constitutional practice and conventions is, therefore, absolutely necessary for a student of law.

The purpose of teaching constitutional law is to highlight its never-ending growth. Constitutional interpretation is bound to be influenced by one's social, economic or political predilections. A student must, therefore, learn how various interpretations of the constitution are possible and why a significant interpretation was adopted in a particular situation. Such a critical approach is necessary requirement in the study of Constitutional law.

**Course Learning Outcomes:**

After the completion of the course the students will be able:

1. To understand the nature, scope and extent of the Fundamental rights
2. To understand the Composition, Role and Functions of Executive, Legislature and Judiciary.
3. To analyze and critic the interrelationship between the different organs of the Government i.e. Executive, Legislature and Judiciary.
4. To apply the knowledge of the constitutional provisions in solving the emerging challenges posed to the constitution.

**Unit I: Introduction to Indian Legal System**

- Constitution, Constitutionalism, Constitutional Law, Constitutional Conventions

-2-

- Historical evolution of the Constitution of India during British Raj
- Formation of Constituent Assembly
- Working of Constituent Assembly
- Salient Features of Indian Constitution

#### Unit II: Goal, Values, Ideals & Aspirations from the Constitution

- Objectives Resolution
- Preamble to Indian Constitution
- 42<sup>nd</sup> Amendment Act & the Preamble

#### Unit III: Nature of Indian Union

- Indian Union
- Formation, Creation and Establishment of new States under the Union
- Citizenship

#### Unit IV: Fundamental Rights

- Definition of State
- Definition of Law
- Right to Equality
- Fundamental Freedoms
- Right to Life & Personal Liberty
- Right against Exploitation
- Right to Religion
- Right to Constitutional Remedies

#### Unit V: Organs of the Government

- Union Executive
- Union Parliament
- Union Judiciary

#### Unit VI: Emergency Provisions

- National Emergency
- State Emergency
- Financial Emergency

#### Unit VII: Amendment to the Constitution

- Need for Amendment
- Types of Amendment
- Procedure for Amendment

#### Unit VIII: Constitutional Bodies

- Comptroller & Auditor General of India

- Finance Commission of India
- Election Commission of India

#### Unit IX: Panchayati Raj Institutions

- Committees
- 73<sup>rd</sup> & 74<sup>th</sup> Amendment Act
- Rural Local Bodies
- Urban Local Bodies
- PESA Act

#### Text Book:

1. M. P. Jain, Constitutional Law, 6<sup>th</sup> Edition Lexis Nexis Butterworths.
2. V. N. Shukla's, Constitution of India, 12<sup>th</sup> Edition, Eastern Book Company
3. J.N. Pandey, The Constitutional Law of India, 50<sup>th</sup> Edition, Central Law Agency

#### Reference:

1. H.M. Seervai, Constitutional Law of India (4th ed., Vol 1 (1991), Vol. 2 (1993), Vol.3 (1996)
2. D.D. Basu, Shorter Constitution of India (14th ed., 2009)
3. V.D. Sebastian, Indian Federalism the Legislative Conflicts (1985).
4. B. Shiva Rao, The Framing of India's Constitution – Select Documents (1967)
5. Granville Austin, Indian Constitution: Corner stone of the nation (1966)
6. Granville Austin, Working a Democratic Constitution - A History of the Indian Experience (1999)

-4-





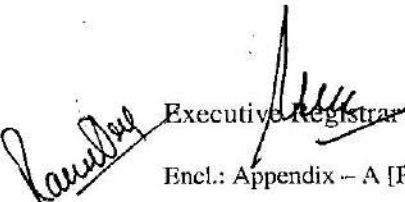
NU/AC/170417/IL/Uni Elec-IPR/17- 66  
Date: 11.05.2017

**NOTIFICATION**

- Read: 1. **Regulation No. 44 of Academic Regulations for Admission to University, etc. published vide notification No. NU-442 dated 27.1.2004 – Empowering Academic Council to approve teaching & examination scheme, syllabus, etc.**  
2. **Notifications mentioned in Handbook-IV, updated up to April, 2015**  
3. **Notification Nos. NU-128, NU-138 to NU-148, NU-153, Nov. 2015**  
4. **Notification Nos. NU-314 to NU-317, NU-322 to NU-325, Oct. 2016**  
5. **Notification Nos. NU-006 to NU-007, Jan. 2017**  
6. **Notifications published in Apr. 2017**  
7. **Resolution No. 3 – Faculty of Law Meeting – 05.04.2017**  
8. **Resolution No. 6(C) – Academic Council Meeting – 17.04.2017**

Sub: **Introduction of University Elective course- 'Intellectual Property Rights' along with its syllabus**

It is, hereby, notified for information of all concerned that, the Academic Council in its meeting held on 17.04.2017 under resolution No. 6(C); in exercise of powers conferred upon it by the Board of Governors under regulation mentioned at serial 1 above, taking into consideration the recommendation of Faculty of Law, has resolved to approve the introduction of University Elective course- 'Intellectual Property Rights' along with its syllabus, to be offered to the students of various Institutes, *other than* Institute of Law to be made effective from academic year 2017-18 and onwards as per *Appendix-A* attached herewith.

  
Executive Registrar

Encl.: Appendix – A [Pages 1 to 2]

To,

1. All Heads of Institute
2. Dean, Faculty of Law
3. Dy. Registrar (Examination)
4. Chief Librarian

Copy to: P.A. to: ER, Dir (IL)

- c.f.w.cs. for information to:
1. Vice President
  2. Director General
  3. Director (A&GA)

Appendix-A  
(Noti. NO. NU-066  
Acmtg. -17.4.17)

**NIRMA UNIVERSITY**  
**INSTITUTE OF LAW**  
University Elective Course  
Academic Year 2017-18

L	T	PW	C
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Course Code	
Course Title	Intellectual Property Rights

**Course Learning Outcomes:**

At the end of this course the student will able to:

1. Understand on various facets of IPR including Trade Mark, Patent, Copyright and Design Law
2. Identify various issues and challenges related to IPR.

**Syllabus**

**Teaching Hours: 45**

**Unit 1 Introduction**

**6 Hours**

- 1.1 Concept of Property
- 1.2 Concept of Intellectual Property
- 1.3 Various Justification of Property
- 1.4 Introduction to TRIPS Agreement

**Unit 2 Patent Law**

**9 Hours**

- 2.1 Concept and basis of protection
- 2.2 Criteria of Patentability
- 2.3 Novelty, Utility and Non-obviousness
- 2.4 Non Patentable Inventions
- 2.5 Procedure for patent registration
- 2.6 Rights of Patentee and Infringement procedure
- 2.7 Green Patents
- 2.8 Leverage of Patents

**Unit 3 Copyrights Law**

**8 Hours**

- 3.1 Introduction and justification
- 3.2 Subject-Matter of Copyright
- 3.3 Literary, Dramatic, Musical, Artistic, Cinematograph Films and Sound Recordings
- 3.4 Copyright and related rights
- 3.5 Fair use

3.6 Rights covered under copyright & remedies for infringement

**Unit 4 Trademarks Law**

**8 Hours**

4.1 Concept and justification of trademarks protection

4.2 Types of marks - Distinctiveness, Descriptive marks, Generic marks and Well-Known Trademarks

4.3 Grounds of Refusal of Registration

4.4 Procedure for Registration

4.5 Rights of trademark owner and Infringement – passing off of trademarks

4.6 Trademarks and Geographical indication

**Unit 5. Design Law**

**8 Hours**

5.1 Basics of Design & Justifications for protecting designs

5.2 Features of Shape, Configuration, Pattern, or Ornament or Composition of Lines or Colour

5.3 Excluded Subject-Matter

5.4 Rights of Design owner and protection against Infringements

**Unit 6. Traditional Knowledge and Biodiversity**

**6 Hours**

6.1. Concept of Traditional knowledge

6.2 Bio-piracy and bio-prospecting

6.3 Access and benefit sharing under CBD

**Suggested Readings:**

- Ahuja V K, Intellectual Property Rights. Lexis Nexis- Butterworths, New Delhi, 2015
- B.L. Wadhwa, Law on Intellectual Property Rights, Universal Publication, 2014
- Cornish, W R, Cases and Materials on Intellectual Property, 3<sup>rd</sup> Ed. London: Sweet & Maxwell, 1999.
- Verkey Elizabeth, Law of Patents. Second Edition, Eastern Book Company, Lucknow, 2012

**NIRMA UNIVERSITY**  
**Institute of Management**  
**University Elective**

**Course Title:** Indian Economy

**Credit Hours:** 3

**Course Number:** UEIM001

**Course Objectives**

- To introduce the students to the various dimensions of the Indian Economy
- To provide a historical and current analysis of how the Indian Economy has reached its current state of affairs

**Learning Outcomes**

At the end of the course, students shall be able to:

1. Understand the various aspects of India's economy
2. Develop a perspective on the different problems and approaches to economic planning and development in India
3. Understand the role of the Indian Economy in the global context, and how different factors have affected this process

**Syllabus**

<b>Module 1: STRUCTURE OF THE INDIAN ECONOMY</b>
<ul style="list-style-type: none"><li>• India As A Developing Economy; Indian Economy On The Eve Of Independence; National Income Of India: Trends And Levels</li><li>• Human Resources And Economic Development; Human Development In India; Occupational Structure And Economic Development</li><li>• Natural Resources, Economic Development And Environmental Degradation</li><li>• Infrastructure In The Indian Economy; Social Infrastructure And Social Sector</li></ul>
<b>Module 2: PLANNING AND ECONOMIC DEVELOPMENT</b>
<ul style="list-style-type: none"><li>• Objectives And Strategy Of Economic Planning In India;</li><li>• Approach To The Ongoing Five Year Plan</li><li>• Regional Planning In India</li><li>• Financing Of The Plans</li><li>• Economic Reforms In India – Main Features And Achievements.</li></ul>

<b>Module 3: DOMESTIC SECTOR</b>
<ul style="list-style-type: none"> <li>• Institutional And Technological Reforms In Indian Agriculture</li> <li>• Agricultural Finance And Marketing</li> <li>• Agricultural Prices And Policy</li> <li>• Industrial Policy</li> <li>• Sources Of Industrial Finance; Role Of Small Scale And Cottage Industries In Indian Economy.</li> </ul>
<b>Module 4: EXTERNAL SECTOR OF THE ECONOMY</b>
<ul style="list-style-type: none"> <li>• India's Balance Of Payments – Problems And Solutions</li> <li>• Trends, Composition And Direction Of India's Foreign Trade</li> <li>• New Trade Policy</li> <li>• WTO And Indian Economy</li> <li>• Foreign Investment Inflows</li> <li>• India's Exchange Rate Policy</li> </ul>
<b>Module 5: ISSUES AND CHALLENGES OF INDIAN ECONOMY</b>
<ul style="list-style-type: none"> <li>• Problems Of Poverty</li> <li>• Inequality</li> <li>• Unemployment And Inflation - Strategy And Policy Of The Government</li> <li>• Food Security And Public Distribution System</li> <li>• Salient Features Of The Relevant Union Budget</li> </ul>

### Suggested Readings

- Datt, R and Sundharam, K.P.M. Indian Economy. New Delhi: S. Chand & Company Ltd. (Latest Edition).
- Jalan, B. The Indian Economy: Problems and Prospects. Penguin Books.
- Misra, S.K. and Puri, V.K. Indian Economy. Himalaya Publishing House.
- Agrawal, A.N. Indian Economy: Problems of Development and Planning. New Age International Publishers.
- Economic Survey. Government of India (Latest Issue).
- Relevant Business Newspapers.



**NIRMA UNIVERSITY**  
**Institute of Management**

**University Elective**

**Course Title:** Introduction to Strategic Management

**Credit Hours:** 3

**Course Number:** UEIM002

**Course Objectives**

- To introduce the students to strategic management
- To provide knowledge about concepts & frameworks required to analyse a firm in business context

**Learning Outcomes**

At the end of the course, students shall be able to:

1. Understand the role of strategy in business,
2. Develop an understanding of the basic strategy framework,
3. Apply frameworks regarding how firms gain advantage in the marketplace.

**Syllabus**

<b>Module 1: INTRODUCTION TO STRATEGY</b>
<ul style="list-style-type: none"><li>• Meaning &amp; Scope of Strategy</li><li>• The process of strategic management</li><li>• Introduction to the Vocabulary of Strategy: Vision, Mission, Goals, Objectives, Values, Strategy, Resources and Capabilities</li></ul>
<b>Module 2: THE BUSINESS LANDSCAPE</b>
<ul style="list-style-type: none"><li>• Sectors &amp; Industries</li><li>• Analysing A Company's External Environment</li><li>• Understanding A Company's Strategy, Resources, Capabilities</li><li>• Phases In Industry's Development</li></ul>

<b>Module 3: GAINING COMPETITIVE ADVANTAGE</b>
<ul style="list-style-type: none"> <li>• Generic Strategies</li> <li>• Analytical Tools For Competitive Advantage</li> </ul>
<b>Module 4: STRATEGY EXECUTION</b>
<ul style="list-style-type: none"> <li>• People Management Aspects</li> <li>• Resource Management And Operations</li> <li>• Corporate Culture And Leadership Issues</li> </ul>

### **Suggested Readings**

- Chandrasekaran, N & Ananthanarayanan, P. S. (2011). Strategic Management. New Delhi: Oxford University Press.
- Phadtare, M. (2010). Strategic Management: Concepts and Cases. New Delhi: PHI Learning.
- Srinivasan, R. (2014). Strategic Management: The Indian Context. New Delhi: PHI Learning.
- Bhandari, A & Verma, R. P. (2013). Strategic Management: A Conceptual Framework, New Delhi: McGraw Hill Education (India) Pvt. Ltd.
- Ghemawat P. (2009). Strategy and the Business Landscape. New Delhi: Prentice Hall

**NIRMA UNIVERSITY**  
**Institute of Management**  
**University Elective**

**Course Title:** Fundamental of International Business  
**Credit Hours:** 3  
**Course Number:** UEIM003

**Course Objectives**

- To introduce the students various concepts and issues in international business and related activities.
- To evaluate global business opportunities and develop skills to deal with various issues involved in cross-border transaction of goods, services and other resources between two or more nations.

**Learning Outcomes**

At the end of the course, students shall be able to:

1. understand and evaluate the basis of international trade and business.
2. explain the various methods of entry into foreign markets and assess the suitable mode for international business.
3. understand the concept of globalization and discuss the implications of GATT/WTO in international business.
4. understand the India's institutional and policy framework for international business.

**Syllabus**

**Module 1: AN OVERVIEW TO INTERNATIONAL BUSINESS**

**Introduction**

- Evolution Of International Business
- Stages Of Internationalization
- International Business Approaches
- Importance Of Cross Cultural Differences In International Business
- Modes Of Entry Into International Markets
- Advantages And Problems Of International Business

**Module 2: CONCEPTUAL FRAMEWORK: INTERNATIONAL TRADE, INVESTMENT, BALANCE OF PAYMENT AND TERMS OF PAYMENT**

- Mercantilism
- Theory Of Absolute Cost And Comparative Cost Advantage
- Relative Factor Endowment Theory
- Product Life Cycle Theory
- Porter's National Competitive Advantage Theory
- Foreign Collaboration/Technology Transfer Related Issues
- Factors Influencing FDI
- Reasons And Cost And Benefits Of FDI
- Concept Of Balance Of Payments And Its Components
- Terms Of Payment

**Module 3: GLOBALISATION, WORLD TRADE ORGANISATION AND REGIONAL ECONOMIC INTEGRATION**

- Concept Of Globalization
- Drivers Of Globalization
- Globalization Of Markets, Production, Investment, Technology
- Advantages And Disadvantages Of Globalization
- General Agreement Of Tariff And Trade
- Uruguay; Round, Establishment Of WTO And Various Agreement Of WTO
- GATS - Trade In Services
- Concept Of Regional Integrations And Regional Blocks

**Module 4: INDIA'S INSTITUTIONAL AND POLICY FRAMEWORK FOR INTERNATIONAL BUSINESS**

- Policy And Service Support Organizations
- Commodity Specialization
- Training And Research Institutions
- Trading / Service Corporations
- Risk Covering Institutions
- Financial Institutions
- Institutions Especially For SSIs and State Participation
- An Overview Of India's Foreign Trade Policy And Procedure

### **Suggested Readings**

- Carbaugh J. R. International Economics. Bangalore: Thompson South-Western, Latest Edition.
- Chugan, P. K. International Technology Transfer. Mumbai: Himalaya Publishing House.
- Czinkota R.M., Ronkained I.A. and Moffet, M.H. International Business. Bangalore: Thompson South-Western. Latest Edition.
- Foreign Trade Policy and Handbook of Procedures. New Delhi: Centax Publications. Latest Edition.
- Francis C. International Business Environment. New Delhi: Prentice-Hall India, Latest Edition
- Joshi, R. M. International Business. New Delhi: Oxford University Press. Latest Edition.
- Mithani, D.M. International Economics. Mumbai: Himalaya Publishing House. Latest Edition.
- Paras R. Export – What, Where and How. New Delhi: Anupam Publications. Latest Edition.
- Paul, Justin. International Business. New Delhi: PHI Learning Pvt. Ltd. Latest Edition
- Rao, S. P. International Business; Text and Cases. Mumbai: Himalaya Publishing House. Latest Edition.

**NIRMA UNIVERSITY**  
**Institute of Management**  
**University Elective**

**Course Title:** Elements of Management

**Credit Hours:** 3

**Course Number:** UEIM004

**Course Objectives**

- To familiarize the students with the Management Discipline.
- To understand the role of a manager in managing people and organizational activities.

**Learning Outcomes**

At the end of the course, students will be able to:

1. Understand the major functions of management viz. Planning, Organizing, Leading and Controlling,
2. Describe the interrelationship among the various functions of Management
3. Develop a general management perspective, and

**Syllabus**

**Module 1: NATURE & EVOLUTION OF MANAGEMENT**

- Meaning & Scope of Management
- Management a Science and/or Art?
- Management Vs Administration
- Management as a Profession
- Evolution of Management Thought
- Early Classical Approaches – Scientific Management, Administrative Management, Bureaucracy
- Neo-Classical Approaches – Human Relations Movement, Behavioural Approaches
- Modern Approaches – Quantitative Approach; Systems Approach; Contingency Approach
- Management Process
- Functional Areas of Management
- Global Applications
- Management Practices in India

## **Module 2: MANAGERIAL ROLE & EXTERNAL ENVIRONMENT**

- Role of Managers
- Mintzberg's Ten Managerial Roles
- Functions of Various Levels of Management
- Managerial Skills
- External Environment of the Organization & Its Impact on Organizational Operations
- Globalization and Business Environment

## **Module 3: PLANNING AND ORGANIZING**

### **Planning**

- Planning: Meaning, Need & Importance
- Planning Process
- Types of Plans; Objectives, Policies, Procedures and Methods
- Nature and Type of Policies
- Types of Planning; Advantages & Limitations
- Forecasting: Need & Techniques
- 

### **Organizing**

- Division of Work
- Departmentation; Definition; Departmentation by Function, Territory, Product/Service, Customer Group; Matrix Organization
- Line & Staff; Span of Control
- Authority; Delegation of Authority; Centralization & Decentralization; Formal and Informal Organizations

## **Module 4: Coordination and Control**

### **Coordination**

- Need for Coordination
- Types and Techniques of Coordination
- Coordination Process
- Coordination Characteristics
- Coordination: Advantages and Limitations
- Distinction between Coordination and Co-operation

### **Controlling**

- Concept of Controlling
- Types of Controls
- Design of Control Process
- Control Methods – Financial; Budgetary; Operational; Quality; Information Systems & Control
- Responsibilities of Managers

<b>Module 5: Current Trends in Management</b>
<ul style="list-style-type: none"><li>• Managing Diversity</li><li>• Technology Management</li><li>• Capability Development</li><li>• Management of Family Owned Businesses</li><li>• Relevance of Management to Modern Industries and Government</li></ul>
<ul style="list-style-type: none"><li>• Management Lessons from Indian Ethos</li></ul>






### **Suggested Readings**

1. Stoner, J. A. F. & Freeman, R. E. Management, (6<sup>th</sup> Ed). Prentice Hall, 1995.
2. Prasad, L. M. Principles and Practice of Management. (7<sup>th</sup> Ed). Delhi: Sultan Chand & Sons. 2008.
3. Drucker, P. The Practice of Management. Elsevier Ltd. 1955, Reprint 2007.
4. Hampton, D. R. Contemporary Management. (2<sup>nd</sup> Ed). McGraw Hill. 1981, Reprint 2008.
5. Tripathi, P. C. & Pandey, P. N. Principles of Management . (5<sup>th</sup> Ed). New Delhi: Tata McGraw Hill. 2012.
6. Koontz, H., Weihrich, H. & Aryasri, R. Principles of Management. Tata McGraw Hill. 2004.



**NIRMA UNIVERSITY**  
**Institute of Management**  
**University Elective**

**Course Title:** Human Resource Management

**Credit Hours:** 3

**Course Number:** UEIM006

**Course Objectives**

- To introduce the students to human resource management function.
- To understand the people management role in organizations.

**Learning Outcomes**

At the end of the course, students will:

1. acquire an insight into the role and responsibilities of the HRM function.
2. learn about the different systems within HRM viz. Recruitment and Selection, Performance Management, Compensation Management, Employee Relationship Management and recognize their strategic contribution to business and organizations
3. carry out job and role analysis and write job descriptions.

**Syllabus**

<b>Module I: Introduction</b>
<ul style="list-style-type: none"> <li>• An Introduction to Human Resource Management</li> <li>• Skills and Competencies of a Human Resource Manager</li> <li>• Corporate Strategy and Human Resource Management</li> </ul>
<b>Module II: Manpower Planning and Talent Acquisition</b>
<ul style="list-style-type: none"> <li>• Manpower Planning and Deployment</li> <li>• Job Analysis, Design and Redesign of Jobs</li> <li>• Recruitment &amp; Selection</li> </ul>
<b>Module III: Managing and Rewarding Employee Performance</b>
<ul style="list-style-type: none"> <li>• Performance Management</li> <li>• Compensation Management</li> <li>• Learning &amp; Development</li> </ul>

<b>Module IV: Managing Employee Relations</b>
<ul style="list-style-type: none"><li>• Employee Relationship Management</li><li>• Industrial Disputes &amp; Conflicts</li><li>• Labour Legislation</li><li>• Managing Employee Exit and Separations</li></ul>
<b>Module V: Contemporary issues in Human Resource Management</b>



### Suggested Readings

- Dessler, G. Varkkey, B. (2011). Human Resource Management. (12<sup>th</sup> Edition). New Delhi: Pearson Education.
- Bernardin, J. H. (2007). Human Resource Management – An Experiential Approach. New Delhi: Tata McGraw Hill Publishing Company Limited.
- Singh B.D. (2004). Industrial Relations, Emerging Paradigms. New Delhi: Excel Books.
- Varkkey, B., Dutta, R. and Rao, G. P. (Eds). (2000). Value Creation: The Challenge of HR in the New Millennium. New Delhi: Tata McGraw-Hill Publishing Company Limited.
- Ramaswamy, E.A. (2000). Managing Human Resources: A Contemporary Text. New Delhi: Oxford University Press.
- Pande, S. and Basak, S. (2012). Human Resource Management. (1<sup>st</sup> Edition). New Delhi: Pearson Education.

**NIRMA UNIVERSITY**  
**Institute of Management**  
**University Elective**

**Course Title:** Financial Management

**Credit Hours:** 3

**Course Number:** UEIM007

**Course Objectives**

- To provide students with the basic understanding of financial management in an organizational context
- To help them understand the working of financial markets
- To enable them to use spreadsheets to perform financial analysis

**Learning Outcomes**

At the end of the course, students shall be able to:

1. Understand the significance of financial management to firm performance
2. Identify the variables important to making financial decisions
3. Perform primary investment decision analysis
4. Describe sources of funds and their costs
5. Perform basic financial analysis using spreadsheets

**Syllabus**

<b>Module 1: Basics of Financial Management</b>
<ul style="list-style-type: none"><li>• Introduction to Financial Management</li><li>• Role and Functions of the Finance function</li><li>• Time Value of Money</li><li>• Basics of Risk and Return</li></ul>
<b>Module 2: Financial Markets and Instruments</b>
<ul style="list-style-type: none"><li>• The Financial System</li><li>• Introduction to Financial Markets and Instruments</li><li>• Sources and Cost of Capital</li></ul>

<b>Module 3: Major Financial Decisions</b>
<ul style="list-style-type: none"> <li>• The Investment Decision</li> <li>• The Funding Decision</li> <li>• The Distribution of Profit Decision</li> <li>• Introduction to Working Capital Management</li> <li>• Managing Risk</li> </ul>
<b>Module 4: Using Spreadsheets in Finance</b>
<ul style="list-style-type: none"> <li>• Introduction to Financial functions in Spreadsheets</li> <li>• Spreadsheet Application Exercises</li> </ul>

### Suggested Readings

1. Chandra, P. (2010). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
2. Khan, M. Y. & Jain, P. K. (2012). Fundamentals of Financial Management. New Delhi: Tata McGraw Hill.
3. Pandey, I. M. (2011). Essentials of Financial Management. New Delhi: Vikas Publishing House.
4. Ross, S., Westerfield, R. & Jordan, B. (2012). Fundamentals of Corporate Finance. New Delhi: Tata McGraw Hill.
5. Rustagi, R. P. (2011). Financial Management: Problems & Solutions. New Delhi: Taxmann.
6. Wachowicz J. M. & Van Horne, J. C. (2009). Fundamentals of Financial Management. New Delhi: PHI Learning

**NIRMA UNIVERSITY**  
**Institute of Pharmacy**

**(B. Pharm)**  
**(Semester - VII)**  
**University Elective**

L	T	P	C
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<b>Course Code</b>	<b>UEIP007</b>
<b>Course Title</b>	<b>Advanced Instrumental Techniques</b>

**Scope:**

This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

**Objectives:**

Upon completion of the course, the student shall be able to-

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

**Course Learning Outcomes (CLO):**

At the end of the course, students will be able to -

1. Recall the fundamental theory of different spectroscopic techniques. E-1
2. Recognize the fundamentals, instrumentation and application of various chromatographic methods S-17
3. Discuss the instrumentation and application of various spectroscopic techniques S-19
4. Describe various X-ray methods E-1
5. Apply the knowledge of chromatographic techniques for the separation of the component. ENT-13

Syllabus:

Teaching hours: 45 Hours

**UNIT I**

10 Hours

- **Spectroscopic Techniques**  
**UV-Visible spectrophotometry:** Theory of electronic spectroscopy absorption by organic molecules, choice of solvent and solvent effect, applications of UV-Visible spectroscopy.
- **Infra-red spectrophotometry:** Absorption in the infrared region, factors influencing molecular vibrations, applications, interpretation of infra-red spectra, FTIR- Theory, Instrumentation.

**UNIT II**

10 Hours

- **Nuclear Magnetic Resonance Spectroscopy:** Basic principles, the theory of PMR spectroscopy, Instrumentation, Chemical shift, spin-spin coupling, factors affecting chemical shift and spin coupling, applications, <sup>13</sup>C NMR spectroscopy, interpretation of NMR spectra.
- **Mass spectroscopy:** Basic principles, ion formation and types, Fragmentation rules, recognition of molecular ion peak, interpretation of spectra and applications.

**UNIT III**

10 Hours

- **Raman Spectroscopy:** Basic principle, instrumentation, applications.
- **Atomic absorption and atomic emission spectroscopy:** Basic principles, instrumentation, applications.
- **X-ray diffraction methods:** Introduction, Bragg's law, X-ray absorption and X-ray diffraction methods and applications.

**UNIT IV**

15 Hours

- **Separation techniques**  
Classification of chromatographic methods based upon the mechanism of separation and mode of separation with its fundamental principle, instrumentation and application  
**High-Pressure Liquid Chromatography**  
**Gas chromatography**  
**High-Performance Thin Layer Chromatography**

**Suggested Readings**<sup>^</sup>: (Latest edition)

1. Silverstein, R. M., Bassler, G. C., & Morrill, T. C. Spectrometric Identification of Organic Compounds, John Wiley & Sons. Inc., New York.
2. Kalsi, P. S., Spectroscopy of organic compounds. Place of publication not identified: New Age International Pvt
3. Skoog, D. A. H., James, F., & Nieman, T. A. Principles of Instrumental Analysis. Eastern press.
4. Lindsay, S. High performance liquid chromatography. Chichester: Wiley.

w.e.f. academic year 2020-21 and onwards

5. Ferraro, J. R., Nakamoto, K., & Brown, C. W. Introductory Raman spectroscopy. Amsterdam: Academic Press.
6. The United States Pharmacopeia. By authority of the United States Pharmacopoeial Convention meeting at Washington, D.C., May 14 and 15, 1940. Easton, PA: Mack Print.
7. Sethi, P. D. HPTLC: High performance thin layer chromatography: Quantitative analysis of pharmaceutical formulations. New Delhi: CBS publ.

L= Lecture, T= Tutorial, P= Practical, C= Credit

^ this is not an exhaustive list

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**NIRMA UNIVERSITY  
INSTITUTE OF PHARMACY**

**UNIVERSITY ELECTIVE**

**COURSE NAME: COSMETIC TECHNOLOGY**

**Learning Outcomes:**

After successful completion of the course student will be able to :

- Acquire comprehensive knowledge about the various raw materials used in cosmetic formulations
- Create and develop cosmetic formulations
- Analyze the cosmetic formulations for evaluating its efficacy and safety
- Understand the regulatory guidelines related to cosmetic formulations

**Theory (Detailed Syllabus)**

**L   P   C**  
**3   -   3**

1. Introduction: The scope, historical background and present status of herbal cosmetics.
2. Classification of Cosmetics.
3. Raw materials used for formulation of skin care and hair care cosmetics: Source and description of raw materials of natural origin like fixed oils, waxes, gums, hydrophilic colloids, colours, perfumes, protective agents, bleaching agents, preservatives, antioxidants and other ancillary agents used in the cosmetic formulations.
4. Formulation and analysis of cosmetics: hair care, skin care and oral care products.
5. In vitro and in vivo models for efficacy testing for various cosmetic products.
6. Regulatory guidelines:  
Compliance of Drug & Cosmetic Act 1940 with reference to provisions for packaging and labelling (Rule 150 A, schedule S), permitted colors, flavors etc.  
BIS guidelines for cosmetic products and raw materials.

**Total Lectures: 45**

**Books Recommended:**

1. Sagarin Edward, Cosmetic Science and Technology Vol. I, II, III , Wiley India Pvt. Ltd., Canada, 1992
2. Sharma P.P., Cosmetic Formulation, Management and Quality Control, Vandana Publications Pvt. Ltd., Vandana Publications, Delhi, 2010
3. Paye M, Barel A.O., Maibach H.I., Handbook of Cosmetic Sciences, Informa Press, Tylor and Fransis, LLC, 2006
4. Panda H., Herbal Cosmetics Handbook, Asia pacific Business press, 2004
5. Veermeer B.J., Cosmeceuticals: Drugs vs. Cosmetics, Marcel Dekker, Editors: Peter Elsener, Howard I. Maibach, Marcel Dekker Inc., New York, 2000.



## PROPOSED SYLLABUS

### NIRMA UNIVERSITY INSTITUTE OF PHARMACY

#### UNIVERSITY ELECTIVE *COURSE NAME: HEALTH AND NUTRITION*

#### Learning Outcomes

After successful completion of the course student will be able to:

1. Remember the fundamentals of health and nutrition
2. Cite examples of food labelling
3. Describe significance of macronutrients and micronutrients
4. Discuss importance of functional foods
5. Explain indicators of nutritional status

#### Theory

L	P	C
3	--	3

1. Introduction to the basic concepts of health and nutrition
2. Nutrition
  - Macronutrients: Carbohydrates (including dietary fibers), fats and proteins
  - Micronutrients: Vitamins, minerals, anti-oxidants, gut flora
  - Significance of macronutrients and micronutrients for optimal health
3. Meal Planning
  - Functional foods: Definition of functional foods, Role of functional ingredients and food in nutrition, Health attributes of functional foods
  - **Health attributes of nutrition: Diet and disease, Diet with respect to special population (elderly, pediatric and pregnant women),**
  - Indicators for maintenance of nutritional status: Nutrition Balance Indicator, Satiety Index, Fullness factor, Glycemic index and insulin index
4. Food Labelling (**Food service management**)
  - Nutrition Facts Panel
  - Serving Size
  - Calories
  - Ingredients list
  - Quantitative indications
  - Food additives
  - The percent daily value
  - Allergan labelling

L	T	P	C
3	-	-	3

<b>Course Code</b>	UEIP007
<b>Course Title</b>	Drug Discovery and Development

**Course Learning Outcomes (CLO):**

After successful completion of the course, student will be able to –

1. Understand the overall process for drug discovery and development.
2. Describe various methods of drug discovery.
3. Discuss different techniques of drug design and molecular modeling.
4. Explain the role of combinatorial chemistry in rational drug design.
5. Use bioinformatics, cheminformatics, genomic and proteomics knowledge for drug discovery.

**Syllabus:**

**Teaching hours: 45 Hours**

**UNIT I**

**10 Hours**

**Introduction to Drug Discovery and Development**

- Historical development, drug development pipelines, various stages and their importance, improvement of existing drugs, pre-marketing development of drugs, synthetic screening including extensive screening, random screening of intermediates and final leads, source of new drug discovery.

**UNIT II**

**10 Hours**

**Methods in Drug Discovery**

- Introduction, structure activity relationships and quantitative structure activity relationships, structure toxicity relationships, various physiological properties, mathematical models, experimental and theoretical approaches of physicochemical parameters, parameter inter-dependence, case studies.

**UNIT III**

**10 Hours**

**Drug Design and Molecular Modeling**

- General introduction, pharmacophore model, primary biological targets, structural determination of primary targets, introduction to docking, molecular docking, *in silico* prediction by molecular docking, methodologies with suitable case studies.

**UNIT IV**

**10 Hours**

**Combinatorial Chemistry in Drug Design**

- Introduction, principle of combinatorial chemistry, synthetic methodologies including solid phase synthesis (SPS) and solution phase chemistry, high throughput screening, library preparation.

**UNIT V**

**05 Hours**

**Bioinformatics, Cheminformatics, Genomic and Proteomics**

- Introduction, application, significances in new drug discovery, suitable case studies in each topic.

### Suggested Readings<sup>^</sup>: (Latest edition)

1. Robert, G.C.K. ed. *Drug Action at the Molecular Level*. University Park Press Baltimore.
2. Cohen N. C. *A Guidebook on Molecular Modeling and Drug Design*. Elsevier Publications.
3. Wilson, C. O., Beale, J. M., & Block, J. H. Wilson and Gisvold. *A textbook of organic medicinal and pharmaceutical chemistry*. Lippincott Williams & Wilkins.
4. Foye, W. O. *Foye's principles of medicinal chemistry*. Lippincott Williams & Wilkins..
5. Koro I.A. Burckhalter J.H. *Essentials of Medicinal Chemistry*. Wiley Interscience
6. Burger, A., & Abraham, D. J. *Burger's medicinal chemistry and drug discovery* (Vol. I-IV). Wiley.
7. Krogasgaard, P. *A textbook of Drug Design and Development*. Harwood Academics.
8. Smith, H. J., & Williams, H. (2016). *Introduction to the principles of drug design*. Elsevier.
9. Silverman, R. B., & Holladay, M. W. (2014). *The organic chemistry of drug design and drug action*. Academic press.

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<sup>^</sup> this is not an exhaustive list